LUDZIE NAUKI

NOMINACJE PROFESORSKIE

Prof. dr hab. inż. IWONA ZARZYKA

Postanowieniem Prezydenta Rzeczypospolitej Polskiej z dnia 13 grudnia 2023 r. dr hab. inż. Iwona Zarzyka z Katedry Chemii Organicznej Wydziału Chemicznego Politechniki Rzeszowskiej uzyskała tytuł naukowy profesora nauk inżynieryjno-technicznych w dyscyplinie inżynieria chemiczna. Uroczyste wręczenie nominacji profesorskiej odbyło się w Pałacu Prezydenckim w dniu 30 stycznia 2025 r.

Prof. dr hab. inż. Iwona Zarzyka w 2003 r. ukończyła studia magisterskie na Wydziale Chemicznym Politechniki Rzeszowskiej. Na tym samym wydziale, po przedłożeniu dysertacji pt. „Hydroksyalkilowanie kwasu parabanowego" (promotor: prof. dr hab. inż. Jacek Lubczak), uzyskała stopień naukowy doktora nauk chemicznych w dyscyplinie technologia chemiczna. Na podstawie rozprawy habilitacyjnej „Oligomery i polimery zawierające fragmenty strukturalne imidazolidynotrionu i kwasu borowego" w 2015 r. uzyskała stopień naukowy doktora habilitowanego nauk chemicznych w tej samej dyscyplinie i została powołana na stanowisko profesora uczelni, a po nominacji profesorskiej w 2023 r. na stanowisko profesora. Od października 2024 r prof. dr hab. inż. Iwona Zarzyka. pełni funkcję Kierownika Katedry Chemii Organicznej Wydziału Chemicznego Politechniki Rzeszowskiej.

Fot. Prof. Iwona Zarzyka podczas uroczystości wręczenia nominacji, w towarzystwie Prezydenta RP Andrzeja Dudy

Obszar zainteresowań naukowych prof. dr hab. Iwony Zarzyki obejmuje syntezę, modyfikację i charakterystykę tworzyw poliuretanowych (litych i spienionych) o zwiększonej odporności termicznej i zmniejszonej palności. Obecnie zajmuje się wytwarzaniem liniowych poliuretanów z udziałem handlowych polioli w celu modyfikacji właściwości naturalnych poliestrów - poli(hydroksyalkanianów), a w szczególności kwasu poli(3-hydroksymasłowego). Wprowadzenie poliuretanów skutkuje poprawą właściwości termicznych, przetwórczych i mechanicznych poliestrów, dzięki czemu mogą być stosowane do produkcji wyrobów biodegradowalnych. Odrębną tematykę stanowi synteza pochodnych imidazochinolinów i imidazochinazolinodionów oraz ich analogów siarkowych, badanie ich struktury z wykorzystaniem modelowania molekularnego, a także ocena ich aktywności biologicznej.

W ramach działalności naukowej prof. dr hab. inż. Iwona Zarzyka współpracuje z licznymi ośrodkami w kraju i za granicą, m.in. z Uniwersytetem Tomasa Baty w Zlinie (Czechy), Katedrą Podstaw Konstrukcji Maszyn i Materiałoznawstwa Wydziału Mechanicznego

Uniwersytetu Technologiczno-Humanistycznego w Radomiu, Katedrą Immunologii i Biologii Infekcyjnej Wydziału Biologii i Ochrony Środowiska Uniwersytetu Łódzkiego, Katedrą Chemii i Technologii Poliuretanów Wydziału Inżynierii Materiałowej Uniwersytetu Kazimierza Wielkiego w Bydgoszczy, Katedrą Mechaniki i Informatyki Stosowanej Wydziału Mechanicznego Politechniki Białostockiej oraz z Katedrą Inżynierii Materiałowej i Katedrą Technologii i Przetwórstwa Tworzyw Polimerowych Wydziału Mechanicznego Politechniki Lubelskiej.

Odbyła również kilka staży zagranicznych: w 2004 r. w Instytucie Chemii Makromolekularnej Czeskiej Akademii Nauk w Pradze (Czechy), w 2012 r. w Instytucie Chemii i Technologii Polimerów Włoskiej Akademii Nauk w Neapolu (Włochy), w 2014 r. w Zakładzie Chemii Wydziału Technologii Uniwersytetu Tomasa Baty w Zlinie (Czechy), a w latach 2014–2015 w polskim przedsiębiorstwie „CIS Poliuretany".

Uczestniczyła w realizacji kilkunastu projektów badawczych, w tym w 8 jako kierownik. Obecnie kieruje projektem pt. „Badania wpływu modyfikacji biodegradowalnych poliestrów alifatycznych na właściwości przetwórcze i użytkowe nowatorskich kompozycji polimerowych", realizowanym w ramach konkursu „ISKRA – budowanie międzyuczelnianych zespołów badawczych" organizowanego przez MEN pn. Politechniczna Sieć VIA CARPATIA im. Prezydenta RP Lecha Kaczyńskiego.

Od wielu lat jest ekspertem Narodowego Centrum Badań i Rozwoju oraz Narodowej Agencji Wymiany Akademickiej. Od 2023 r. jest także ekspertem Polskiej Agencji Rozwoju Przedsiębiorczości oraz Urzędu Marszałkowskiego w Rzeszowie w ramach programu regionalnego Fundusze Europejskie dla Podkarpacia.

Dorobek naukowy prof. dr hab. inż. Iwony Zarzyki obejmuje ponad sto publikacji, w tym 97 artykułów naukowych cytowanych przez JCR i 22 publikacje w recenzowanych wydawnictwach zbiorowych, a także 112 wystąpień konferencyjnych, 17 patentów polskich i 8 zgłoszeń patentowych. Indeks Hirscha wynosi 12, a sumaryczny IF = 160. Ponadto prof. dr hab. inż. Iwona Zarzyka jest Guest edytorem w czasopismach z Listy Filadelfijskiej (Molecules, Polymer) oraz recenzentem prac doktorskich i wielu publikacji.

Na podkreślenie zasługuje działalność dydaktyczna i organizacyjna prof. dr hab. inż. Iwony Zarzyki. Pani profesor jest współautorką podręcznika akademickiego „Laboratorium chemii organicznej. Metody syntezy i analizy jakościowej związków organicznych" (Wyd. Oświatowe FOSZE, Rzeszów 2010). Ponadto jest członkiem Rady Wydziału Chemicznego (od 2008 r.), Rady Dyscypliny Inżynierii Chemicznej (od 2019 r.), wydziałowej komisji rekrutacyjnej Szkoły Doktorskiej (od 2022 r.) i Senatu PRz (2024–2028), a także członkiem Komitetu Organizacyjnego Podkarpackiego Konkursu Chemicznego (od 2010 r.) i egzaminatorem Olimpiady Chemicznej w okręgu podkarpackim (od 2004 r.).

Prof. dr hab. inż. Iwona Zarzyka pełniła również funkcję sekretarza Komisji Dydaktycznej ds. Planów i Programów Studiów (2012–2016), koordynatora KRK ds. studiów doktoranckich (2015) i zastępcy przewodniczącego Konwentu Profesorów Wydziału Chemicznego PRz (2019–2020).

Prof. dr hab. inż. Iwona Zarzyka była promotorem 24 prac inżynierskich, 28 prac magisterskich, 2 prac doktorskich oraz promotorem pomocniczym jednej pracy doktorskiej. Obecnie pełni funkcję promotora dwóch doktoratów, w tym jednego wdrożeniowego.

Za swoją działalność naukową, dydaktyczną i organizacyjną otrzymała łącznie 24 nagrody Rektora PRz. W 2021 r. otrzymała Brązowy Krzyż Zasługi, a w 2024 r. Medal Komisji Edukacji Narodowej.

WITRYNA

OBRONY PRAC DOKTORSKICH

Dr inż. Katarzyna Pojnar – *absolwentka Wydziału Chemicznego Politechniki Rzeszowskiej, uzyskała tytuł magistra inżyniera na kierunku technologia chemiczna, specjalność inżynieria materiałów polimerowych. W 2025 r. ukończyła Szkołę Doktorską Politechniki Rzeszowskiej (Katedra Polimerów i Biopolimerów, Wydział Chemiczny PRz), uzyskując stopień doktora w dziedzinie nauk inżynieryjno-technicznych, dyscyplina inżynieria chemiczna. Pracę doktorską obroniła z wyróżnieniem.*

Tytuł pracy: ***Badania nad syntezą żywic akrylowych do lakierów proszkowych***

Promotor: dr hab. Barbara Pilch-Pitera, prof. PRz (Politechnika Rzeszowska)

Promotor pomocniczy: dr inż. Łukasz Florczak (Politechnika Rzeszowska)

Recenzenci:

– prof. dr hab. inż. Kinga Pielichowska (Akademia Górniczo-Hutnicza w Krakowie)

– dr hab. n. med. inż. Dorota Bartusik-Aebisher, prof. UR (Uniwersytet Rzeszowski)

– dr hab. inż. Małgorzata Zubielewicz (Sieć Badawcza Łukasiewicz – Instytut Inżynierii Materiałów Polimerowych i Barwników, Gliwice)

Data i miejsce obrony: 26 lutego 2025 r., Politechnika Rzeszowska, Wydział Chemiczny.

Przedmiotem rozprawy doktorskiej było opracowanie nowych receptur termoutwardzalnych lakierów proszkowych na bazie żywicy akrylowej, a także nadanie im odpowiednich właściwości mechanicznych, hydrofobowych, antykorozyjnych, samonaprawiających i antybakteryjnych, decydujących o końcowym zastosowaniu. Jako podstawowego monomeru użyto metakrylanu 2-hydroksyetylu (HEMA), który w reakcji z grupami izocyjanianowymi, powstałymi w wyniku odblokowania polizocyjanianu (PIC), umożliwił proces sieciowania. Istotnym monomerem był również metakrylan metylu (MMA). Obecność grupy metylowej podstawionej w pozycji α-winylowej zwiększała stabilność termiczną oraz twardość powłoki. Akrylan butylu (BA), zawierający czterowęglowy alifatyczny podstawnik przy grupie estrowej, korzystnie wpływał na zwiększenie elastyczności powłoki. Zastosowanie monomerów zawierających heteroatom, takich jak metakrylan 2,2,2-trifluoroetylu, akrylan 2,2,2-trifluoroetylu poprawiło właściwości fizyko-mechaniczne oraz hydrofobowe otrzymanych powłok proszkowych. Opracowane powłoki spełniały wymagania techniczne Qualicoat. Optymalizacja parametrów procesu wytwarzania lakierów oraz utwardzania powłok proszkowych pozwoliły na zmniejszenie zużycia energii oraz na zastosowanie tych produktów do pokrywania materiałów wrażliwych na wysoką temperaturę, takie jak drewno, płyty MDF czy stopy magnezu. Określenie wpływu struktury chemicznej żywicy akrylowej na właściwości wytworzonych powłok oraz zgodność z wymaganiami technicznymi umożliwiły ich zastosowanie w przemyśle farb i lakierów proszkowych.

W zależności od użytych monomerów do syntezy żywicy akrylowej, wyboru środka sieciującego i dodatków otrzymano lakiery proszkowe niskotemperaturowe lub utwardzane pod wpływem promieniowania UV. W przeciwieństwie do standardowych, komercyjnych antybakteryjnych powłok proszkowych zawierających srebro, otrzymany lakier zawiera naturalne biocydy, takie jak chitozan, montmorylonit interkalowany chitozanem oraz goździki. Wyniki badań opublikowano w dziewięciu artykułach naukowych oraz w trzech rozdziałach w monografii. Dr inż. Katarzyna Pojnar jest również współautorką trzech innych publikacji, które nie wchodzą w skład pracy doktorskiej, ale stanowią jej dorobek naukowy (liczba punktów MNiSW 1260, IF=34,2). W Jej dorobku znajdują się również cztery zgłoszenia patentowe i jeden udzielony patent oraz liczne badania wykonywane dla przedsiębiorstw. Dr inż. Katarzyna Pojnar brała udział w piętnastu konferencjach naukowo-technicznych (krajowych i międzynarodowych), na których wygłosiła dziewięć komunikatów naukowych oraz zaprezentowała pięć posterów. We wrześniu 2024 r., na specjalne zaproszenie wiceprezesa FATIPEC Józefa Kozieła, reprezentowała Polskę (jako młody naukowiec) na międzynarodowej konferencji ETCC (European Technical Coatings Congress), podczas której przedstawiła referat pt. „Novel concepts of using acrylic resin in powder coatings formulation". W ramach konkursu „Drive innovation – the future of sustainable transport," organizowanego przez firmę BASF, zaprezentowała komunikat pt. „Antimicrobial acrylic powder coatings based on environmentally friendly biocides used in transport", za który otrzymała wyróżnienie w postaci wyjazdu do siedziby firmy BASF w Ludwigshafen, w Niemczech. Na konferencji naukowo-technicznej MAT-PUR w roku 2022 otrzymała III miejsce w kategorii komunikat ustny młodego naukowca, a na XIV Kopernikańskim Seminarium Doktoranckim wyróżnienie za najlepszy komunikat naukowy w sekcji nauk chemicznych. Dr inż. Katarzyna Pojnar odbyła siedem wizyt studyjnych, w tym trzy zagraniczne. Brała również udział w sześciu projektach badawczych.

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TWORZYWA W LICZBACH

Tabele 1–4 zawierają dane dotyczące wielkości produkcji surowców i półproduktów chemicznych (tab. 1) oraz najważniejszych tworzyw polimerowych i polimerów (tab. 2), a także wybranych wyrobów z tworzyw polimerowych (tab. 3) i gumy (tab. 4) w grudniu 2024 r.

T a b e l a 1. Produkcja surowców i półproduktów chemicznych w grudniu 2024 r., t
T a b l e 1. Production (tons) of raw materials and chemical intermediates in December 2024

Artykuł	Średnia miesięczna w 2023 r.	Grudzień 2024 r.	Razem I–XII 2024 r.	% I–XII 2024/ I–XII 2023
Węgiel kamienny	4 044 108	3 869 919	44 224 145	91,1
Węgiel brunatny	3 341 267	3 821 579	41 025 828	102,3
Ropa naftowa – wydobycie w kraju	54 015	58 103	607 040	93,7
Gaz ziemny – wydobycie w kraju (tys. m^3)	417 026	416 595	4 835 220	97,2
Etylen	25 017	23 519	343 325	114,4
Propylen	24 584	29 683	386 668	131,1
1,3-Butadien	4 124	5 177	52 717	106,5
Fenol	3 245	2 998	37 778	97,0
Izocyjaniany	175	117	2 852	135,6
ε-Kaprolaktam	7 581	8 082	103 402	113,7

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T a b e l a 2. Produkcja najważniejszych tworzyw polimerowych i polimerów w grudniu 2024 r., t
T a b l e 2. Production (tons) of major polymer materials and polymers in December 2024

Tworzywo polimerowe/polimer	Średnia miesięczna w 2023 r.	Grudzień 2024 r.	Razem I–XII 2024 r.	% I–XII 2024/ I–XII 2023
Tworzywa polimerowe	237 521	210 766	3 138 921	110,4
Polietylen	22 580	27 651	312 744	114,2
Polimery styrenu	13 557	9 915	149 382	94,4
Poli(chlorek winylu) niezmieszany z innymi substancjami, w formach podstawowych	12 979	5 600	211 130	135,6
Poli(chlorek winylu) nieuplastyczniony, zmieszany z dowolną substancją, w formach podstawowych	3 351	2 472	39 866	99,2
Poli(chlorek winylu) uplastyczniony, zmieszany z dowolną substancją, w formach podstawowych	7 468	5 359	98 460	109,9
Poliacetale, w formach podstawowych	15	11	222	126,1
Glikole polietylenowe i alkohole polieterowe, w formach podstawowych	7 393	6 434	89 851	101,4
Żywice epoksydowe, w formach podstawowych	1 018	697	11 173	91,3
Poliwęglany	1 456	903	18 368	101,6
Żywice alkidowe, w formach podstawowych	1 849	987	24 369	114,0
Poliestry nienasycone, w formach podstawowych	8 048	5 451	91 843	105,6
Poliestry pozostałe	4 871	3 120	58 790	95,1
Polipropylen	22 139	19 858	308 310	116,0
Polimery octanu winylu w dyspersji wodnej	2 402	2 383	43 421	150,7
Poliamidy 6; 11; 12; 66; 69; 610; 612, w formach podstawowych	13 081	14 765	205 395	130,7
Aminoplasty	15 977	18 769	244 385	120,7
Poliuretany	2 419	1 402	20 265	100,4
Kauczuki syntetyczne	19 666	24 078	267 704	113,4

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T a b e l a 3. Produkcja wybranych wyrobów z tworzyw polimerowych w grudniu 2024 r.
T a b l e 3. Production of some polymer products in December 2024

Wyrób	Jednostka	Średnia miesięczna w 2023 r.	Grudzień 2024 r.	Razem I–XII 2024 r.	% I–XII 2024/ I–XII 2023
Wyroby z tworzyw polimerowych	tys. zł	7 085 620	5 466 093	81 944 977	94,4
Rury, przewody i węże sztywne z tworzyw polimerowych	t	2 756	19 379	329 040	99,8
w tym: rury, przewody i węże z polimerów etylenu	t	11 031	7 979	125 771	94,3
rury, przewody i węże z polimerów chlorku winylu	t	8 404	5 479	104 321	103,4
Wyposażenie z tworzyw polimerowych do rur i przewodów	t	4 225	3 160	52 099	104,5
Płyty, arkusze, folie, taśmy i pasy z polimerów etylenu, o grubości < 0,125 mm	t	45 569	42 889	625 526	114,4
Płyty, arkusze, folie, taśmy i pasy z polimerów propylenu, o grubości ≤ 0,10 mm	t	10 867	10 005	170 190	124,7
Płyty, arkusze, folie, taśmy i pasy z komórkowych polimerów styrenu	t	33 815	23 676	454 605	110,3
w tym: do zewnętrznego ocieplania ścian	t tys. m²	12 770 9 105	7 445 4 929	157 385 106 290	102,7 97,3
Worki i torby z polimerów etylenu i innych	t	245 945	22 672	324 712	107,8
Pudełka, skrzynki, klatki i podobne artykuły z tworzyw polimerowych	t	25 565	20 801	291 521	104,7
Pokrycia podłogowe (wykładziny), ścienne, sufitowe	t tys. m²	7 096 1 907	8 167 1 873	106 834 26 201	125,5 114,5
Drzwi, okna, ościeżnice drzwiowe	t tys. szt.	41 658 742	38 747 655	553 159 9 660	110,6 108,4
Okładziny ścienne, zewnętrzne	t tys. m²	313 117	211 80	3 593 1 286	95,8 91,5
Kleje na bazie żywic syntetycznych	t	1 385	8 586	77 658	280,6
Kleje poliuretanowe	t	1 382	999	17 904	188,3
Włókna chemiczne	t	2 652	2 133	34 350	107,9
Tkaniny kordowe (oponowe) z włókien syntetycznych	t tys. m²	1 194 3 808	964 3 075	15 983 51 017	111,5 111,7
Nici do szycia z włókien chemicznych	t	40	9	154	67,0

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T a b e l a 4. Produkcja wybranych wyrobów z gumy w listopadzie 2024 r.
T a b l e 4. Production of some rubber products in November 2024

Wyrób	Jednostka	Średnia miesięczna w 2023 r.	Listopad 2024 r.	Razem I–XI 2024 r.	% I–XI 2024/ I–XI 2023
Wyroby z gumy, produkcja wytworzona	t	82 308	54 606	906 240	91,5
Opony i dętki z gumy; bieżnikowane i regenerowane opony z gumy	t tys. szt.	41 666 4 388	28 556 3 878	451 988 54 891	90,4 104,5
w tym: opony do samochodów osobowych	tys. szt.	2 353	1 820	26 946	95,4
opony do samochodów ciężarowych i autobusów	tys. szt.	272	239	2 942	97,0
opony do ciągników	tys. szt.	7	4	72	83,3
opony do maszyn rolniczych	tys. szt.	35	27	345	84,8
Przewody giętkie wzmocnione metalem	t	1 612	864	17 219	89,0
Taśmy przenośnikowe	t km	4 129 2 316	2 911 1 881	38 476 28 440	77,7 102,3

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mgr inż. Małgorzata Choroś

A key year for Polish recycling

The year 2025 will be a key one for the waste management sector in Poland. As one of the last countries in Europe, Poland will introduce a deposit return system in the autumn and intensify work on Extended Producer Responsibility (EPR). For the first time since 1989, efforts have accelerated to bring the country closer to a Circular Economy. This also means the end of multi-billion-dollar fines that the Polish government has been paying annually for failing to meet obligations. The World Recycling Day, celebrated on March 18, provides an excellent opportunity to summarize the achievements to date and assess the prospects for the Polish recycling market. Since 2021, due to liabilities arising from EU regulations, Poland has paid almost 9 billion PLN in fines. In 2024 alone, the fines amounted to over 2 billion PLN. Additionally, according to the Polish Recycling Association, last year, the economy lost over half a million tons of valuable raw materials that could have been reused. While these fines are still being imposed, the breakthrough news for the domestic market is that, due to the proposed changes, this problem will soon come to an end. The good news for the industry coincided with the celebration of World Recycling Day on March 18. It is an excellent opportunity to reflect on what has led Polish recycling to reach this point. Key to understanding this is highlighting the current challenges facing the Polish recycling market and how its development compares to other countries within the European Union. Globally, the current trend in waste management is the implementation of policies aimed at achieving a Circular Economy, such as the European Green Deal. Extended Producer Responsibility (EPR) is an environmental protection strategy that makes producers financially responsible for the post-use phase of their products or packaging. The concept of EPR was formulated by Professor Thomas Lindhqvist and is currently the model used in Europe for financing the collection and management of packaging, waste electrical and electronic equipment, and batteries. Another project bringing Poland closer to a Circular Economy is the deposit return system. This solution, which has been applied for years in many countries worldwide, involves charging a deposit from consumers—a symbolic amount refunded when used cans or bottles are returned for recycling. This is currently the most effective solution for recovering most beverage packaging waste. The deposit return system has been successfully operating in 17 European countries, while EPR is implemented across the entire European Union, except in Poland. The deposit on packaging will be introduced in Poland from October 1 of this year. Experts from the Polish Recycling Association argue that the deposit return system alone is insufficient and ineffective without simultaneously introducing Extended Producer Responsibility regulations, which redirect financial responsibility for the packaging introduced and its management onto producers. The achievements of the waste management industry come at a cost. Legislative delays and failure to meet commitments under EU directives have already cost the state budget over 9 billion PLN. This year's breakthrough in the recycling sector is largely about meeting Poland's obligations and implementing systems that increase responsibility and motivate selective waste collection.

https://www.plastech.pl/

Grupa Azoty: loan for Polyolefins and negotiations with Orlen

Grupa Azoty will provide its subsidiary, Grupa Azoty Polyolefins, with a loan of up to $28 million for the purchase of propane to produce propylene. At the same time, intensive negotiations are underway with Orlen regarding the potential sale of shares in the Polimery Police project or another form of investment. According to the agreement, the talks are to be concluded by March 31, 2025. The loan is intended to enable Polyolefins to purchase a key raw material for its propane dehydrogenation (PDH) facility. The terms of the loan include repayment with interest and collateral on selected company assets. The loan agreement has been supplemented by an annex to the existing agreement between the creditors, which adjusts the obligations to the current financial structure of the project. In the background of the transaction, discussions are ongoing about the future of Grupa Azoty Polyolefins. Based on the agreement signed on January 16, 2025, Orlen and Grupa Azoty are analyzing the possibility of the fuel concern acquiring all or part of the shares in Polyolefins. The process includes a detailed due diligence review and negotiations on the terms of the transaction. As emphasized by Adam Leszkiewicz, President of Grupa Azoty, the goal of the talks is to sell shares as part of the company's restructuring strategy. Cooperation with Orlen could bring mutual benefits, and the transaction is in line with Grupa Azoty's restructuring strategy. The company's previous corrective actions have resulted in savings of PLN 350 million, and further changes are expected to improve the company's financial performance. The Polimery Police project, carried out by Grupa Azoty Polyolefins, remains one of the key undertakings in the Polish chemical industry. The complex, valued at PLN 7.2 billion, uses Oleflex UOP and Unipol GRACE technologies to produce propylene and polypropylene. Its annual production capacity is 429,000 tons of propylene and 437,000 tons of polypropylene, which is of strategic importance for the plastics market in Poland and Europe. The cooperation agreement signed between Orlen, Grupa Azoty, Grupa Azoty Police, and Grupa Azoty Polyolefins is part of a broader strategy for financial stabilization and further development of the project. The negotiations are based on the agreement of December 19, 2023, signed between key stakeholders: Grupa Azoty, Orlen, Hyundai Engineering, and the Korean Overseas Infrastructure & Urban Development Corporation. The

negotiations are scheduled to conclude by March 31, 2025, with the possibility of an extension.

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Scientists from Wrocław University of Science and Technology work on new materials for military shipbuilding

A team of scientists from Wrocław University of Science and Technology is part of an international consortium that has begun research into new stealth technology materials for military ships, the university announced on Wednesday. The project, called ADMIRABLE, has a budget of 10 million euros. It is being carried out by a consortium consisting of shipbuilding companies and research centers. The initiative is funded by the European Defence Fund. The consortium aims to develop a new material for building military ships using stealth technology—methods, strategies, and technologies designed to camouflage military and strategic objects, making them less detectable, for example, by radar. The material will be created by combining several production processes. Dr. Wojciech Stopyra, the leader of the additive manufacturing team in the project, explained that the composite material will consist of various raw materials, such as metals and polymers, with different microstructural geometries for each layer and distinct attributes, including mechanical, electrical, or chemical properties. He noted that currently, no production technique would be able to combine these materials together. Therefore, as part of their collaboration, the team aims to develop a combined production process for this metamaterial composite, which they refer to in their documentation. Researchers in Wrocław are tasked with creating a layer of this metamaterial. It will be produced using additive manufacturing technologies (3D printing) from polymers, metallic alloys, and ceramics. The metamaterial being developed by the Wrocław scientists could find applications not only in the construction of military ships but also in other military-oriented structures. The ADMIRABLE project will take three years to complete. The consortium includes research centers from Spain, Italy, Germany, Luxembourg, Cyprus, and Poland. The project is managed by the Spanish shipbuilding company Navantia. The Italian shipbuilding company Fincantieri, the largest in Europe and the fourth largest in the world, is also a participant in the consortium.

https://naukawpolsce.pl/

Polish expert to lead technical operations at TEPPFA

Dr. Przemysław Hruszka, a respected specialist in chemical technology and materials engineering, will take on the role of Technical Manager at TEPPFA (The European Plastic Pipes and Fittings Association). This change occured in March 2025, when he replaces Peter Sejersen, who has made a significant contribution to the development of the association for nearly a decade. TEPPFA is a European industry organization that represents manufacturers of plastic pipe systems. Its main goal is to promote sustainable infrastructure solutions, ensure high-quality standards, and support innovation in water and sewage systems. The association works closely with EU institutions, standardization organizations, and manufacturers to harmonize regulations and raise industry standards. Dr. Hruszka brings a wealth of experience in the plastics industry, particularly in the context of pipe systems. He has worked with Wavin Technology & Innovation in the Netherlands and Wavin Poland, gaining extensive knowledge of technical standards, regulations, and product certifications. At TEPPFA, his key role will be to further enhance the quality and safety of water systems, with a particular focus on drinking water standards. Ludo Debever, the General Manager of TEPPFA, expressed his enthusiasm for Dr. Hruszka's appointment, highlighting the importance of his expertise and perspective from Eastern Europe in the development of water and sanitation infrastructure. The organization is excited about his contribution, noting that Dr. Hruszka's experience will be invaluable in advancing the association's mission. This appointment is an important milestone for the Polish plastics industry. The presence of a domestic expert in such a prestigious position underscores Poland's growing role in the European pipe systems sector and maintains the high reputation of Polish specialists in materials engineering.

https://tworzywa.online/

Eneris opens recycling center in Kłoda

A modern Recycling Center has been opened in Kłoda, near Piła, by Eneris Surowce, one of the leaders in the Polish waste management market. The investment, worth 64 million PLN, was completed in 2.5 years and is a key element of the waste processing system in the region. Thanks to advanced technologies, the facility will be able to process nearly 100,000 tons of waste annually, contributing to a higher recovery of secondary raw materials and reducing the amount of waste sent to landfills. The plant consists of two independent technological lines – one for processing mixed waste and the other for sorting selectively collected waste. This setup allows for optimal use of available raw materials and reduces operating costs. Eneris has been consistently investing in technologies that increase the recycling rate. For the past ten years, it has been a trusted partner for Polish cities and municipalities in their journey toward a fair transformation, combining environmental responsibility with tangible benefits for society. The facility will enable the recovery of materials such as ferrous and non-ferrous scrap, film, plastics, multi-material packaging (Tetra Pak), glass, and paper. The Recycling Center in Kłoda is proof that a responsible approach to raw materials brings real benefits to both the environment and society. Eneris views waste as valuable resources that can be utilized at

every stage and managed in the most efficient way possible. The construction of the center took place on the site of an existing facility, which required precise planning and close coordination of efforts. A key role was played by employees of Altvater Piła, a company owned by Eneris Surowce, as well as business partners who together ensured that the investment was completed on schedule. The opening of the plant aligns with the goals of the circular economy, which requires increasing recycling rates and reducing waste disposal. In 2024, Eneris significantly expanded its investment portfolio by acquiring Grabplast, a company focused on the recycling of film and the production of plastic bags from LDPE pellets, as well as Bioproten, specializing in the collection and processing of food and catering waste. The company also launched Europe's largest lithium battery recycling plant – Eneris B&R (Batteries & Recycling). Modern recycling infrastructure in Poland is not only an element of fulfilling EU obligations but also an opportunity to build a more efficient waste management system. As one of the market leaders, Eneris continues to develop technologies that enable greater raw material recovery and reduce impact of waste on the environment, which is crucial for the future of the waste management sector in Poland.

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Crisis in the German branch of Boryszew Kunststofftechnik

Boryszew Kunststofftechnik Deutschland, the German subsidiary of the Polish Boryszew Group, has filed for insolvency proceedings. The district court in Stendal has appointed a temporary trustee. According to Mitteldeutsche Zeitung, production at the plant in Gardelegen will continue for at least the next few months, and the salaries of about 500 employees have been secured for three months through insolvency benefits. According to the newspaper, trade unions and the works council point out that the difficult situation was caused by a decrease in orders, rising raw material and energy costs, and limited investments. The German union IG BCE (Chemical and Energy Industry Union) plans to develop a restructuring plan, which will then be presented to the trustee. Boryszew acquired the Altmark plant in 2011 through the acquisition of AKT. The German company manufactures automotive interior parts, including ventilation grilles and handles, primarily for Volkswagen. This automotive giant is also facing difficulties, reducing operations at some factories. The Boryszew Group, which owns 34 plants and employs over 8,500 people, is struggling with a challenging market environment. The restructuring of the automotive sector in Germany is particularly negatively affecting suppliers. Last year, two other German subsidiaries of Boryszew filed for bankruptcy, indicating a deeper crisis in the industry. The difficulties of Boryszew Kunststofftechnik Deutschland are part of a broader issue affecting the European automotive supplier sector. In recent months, several companies in this industry have reported financial problems, resulting from a decline in car production, rising raw material costs, and uncertainty related to the market's shift toward electromobility. In Germany, the situation for suppliers is particularly difficult, as major corporations like Volkswagen are reducing production and implementing cost-saving programs.

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Essity expands its plant in Oława

The Swedish company Essity continues investment in Poland by expanding its production plant in Oława, Lower Silesia. Operating since 1998 and currently employing around 700 people, this facility is one of Essity's largest and most modern plants in Europe. In 2025, the company plans to launch additional production lines and increase employment. The plant manufactures a wide range of hygiene products, including baby diapers, absorbent underwear, and pads for adults, as well as items from brands such as TENA, Libresse, Zewa, and Tork. Recently, production has been expanded to include medical products, such as compression therapy (Jobst) and orthopedic care items (Actimove, Leukoplast). The production processes rely heavily on the use of plastics, particularly polypropylene (PP), polyethylene (PE), and elastomers (SEBS, TPU). These materials are used to manufacture spunbond and meltblown nonwovens, which form the outer and inner layers of hygiene products. PE films serve as moisture barriers, while elastic components ensure wearing comfort and product fit. The product structure also includes PET laminates and fastening elements made of plastic. The production lines integrate multiple processes, from lamination and cutting to automated packaging. High quality is ensured by optical inspection systems and digital management of machine operating parameters. An essential part of the plant's development is the investment in renewable energy sources. In 2024, a photovoltaic farm consisting of 6,500 panels was launched to support the plant's power supply and reduce CO_2 emissions. This initiative is part of Essity's long-term strategy to achieve climate neutrality by 2050.

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WORLD NEWS

Nextek and Coveris join forces to revolutionize mechanical recycling for film production

Nextek, a leader in sustainable technology, and Coveris, an expert in flexible packaging, announced today their collaboration aimed at transforming the mechanical recycling of flexible films through the implementation of the innovative COtooCLEAN process. The goal of this partnership is to enable the processing of used polyolefin packaging (made from polyethylene and polypropylene) into high-quality resins and films suitable for food contact. This collaboration follows Nextek's recent success in receiving an award in the "Circular Solutions for Flexible Packaging" category from the Alliance to End Plastic Waste (AEPW). The award was granted for the COtooCLEAN technology, which uses a unique waterless cleaning and decontamination process to produce materials for food contact from recycled film. As part of the collaboration, a demonstration facility is currently being built in the United Kingdom, where the COtooCLEAN technology will be implemented on an industrial scale. Extensive testing is planned to gather the necessary data to meet legal requirements and showcase the potential of this technology to the entire industry. The ultimate goal is to make this groundbreaking process available worldwide, helping to solve one of the biggest challenges in recycling. Professor Edward Kosior, Managing Director and Founder of Nextek, emphasized the importance of this collaboration, pointing out that COtooCLEAN has the potential to completely transform the film processing industry. Since receiving the AEPW award, the company has moved from the prototype development phase to testing compliance with food-contact material regulations. The collaboration with Coveris represents another important step that will allow for scaling this technology and achieving a circular economy for plastic films. The COtooCLEAN technology addresses a major challenge in recycling polyethylene and polypropylene films, as their decontamination is extremely difficult. By enabling the recycling of materials suitable for food contact, this technology represents a crucial step toward a sustainable future for flexible packaging. Christian Kolarik, CEO of Coveris, shares the enthusiasm, stating that the company is a leader in this area and is excited to collaborate with Nextek on a project that is groundbreaking for the mechanical recycling of food-contact materials. Sustainability is key to Coveris's "No Waste" strategy, and such initiatives represent an important step toward eliminating plastic waste. In combination with the ReCover recycling plant and collaboration with Interzero, this is a significant step toward transforming waste into a valuable resource. Through their joint efforts, Nextek and Coveris demonstrate how innovation and collaboration can lead to solutions that change our reality. This is an important step toward developing a circular economy for plastic recycling, aiming to solve one of the biggest challenges in recycling.

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Berry supports the reusable cup initiative

Berry Global's range of reusable plastic cups has been selected for the pioneering Borrow Cup initiative – a "shared returnable cup" system launched in Glasgow, UK, at the end of January. The Borrow Cup initiative, developed by the award-winning charity Hubbub and reusable packaging systems provider Reposit from Glasgow, is a cup-sharing system where consumers can borrow a returnable cup from any participating location, eliminating single-use cups from circulation. The ongoing 12-week project to gather facts and data involves over 40 businesses, including local cafes and large brands such as Costa Coffee, Caffè Nero, and Burger King UK. Customers pay a £1 deposit for each Borrow Cup, and they can refill it, exchange it for a new one, or receive their deposit back at any participating point of sale. The cups can also be returned to special collection points, where customers receive a digital voucher. Used cups are collected by Reposit, washed at the company's facility, and returned to stores. Berry's reusable cups, made from polypropylene (PP), are available in standard 8, 12, and 16oz sizes with a universal lid fitting all three sizes. These models were selected for the Borrow Cup project due to their durability, easy-to-clean design, and dishwasher compatibility. The cups can also be recycled once they reach the end of their life, where appropriate recycling infrastructure is available. The organizers of the project chose plastic for its lower environmental impact compared to other materials. Current carbon emissions modeling predicts that Borrow Cups will have a smaller environmental impact than single-use cups after just three uses. Additionally, the Berry cups have RFID chips that enable tracking, as well as QR codes that provide information about the program. These RFID chips will help measure popularity, returns, and environmental impact, determining how the Borrow Cup system can become both environmentally and financially viable. According to WRAP, more than three billion single-use cups are consumed annually in the UK. However, research conducted by Hubbub found that while nearly three-quarters of UK residents own a reusable cup, only one-third claim to use it at least once a month. The Borrow Cup program aims to assess whether providing

reusable options at the point of sale, coupled with the convenience of a dense network of return points, will reduce the number of single-use cups used. The founders of Hubbub emphasize the importance of continuously exploring new ways to increase the accessibility of reusable products. The Borrow Cup system aligns with this trend by making it easy for consumers to choose a reusable cup at the point of sale. They also hope to demonstrate how a collaborative model can contribute to the success of returnable cups and understand how it can become both environmentally, commercially, and operationally viable. They express optimism that if successful, the system could be implemented across the UK. Berry's reusable cups, part of the B Circular Range (standard packaging solutions designed with a circular economy in mind), have innovative thermo-insulating ribbing, ensuring comfort and stability for both hot and cold drinks. They are durable yet lightweight, maintaining high quality even after multiple uses. The included universal lid, also made of PP, is leakproof and allows safe transport, enabling users to enjoy hot or cold drinks with or without a straw. Berry's Sales Director for Reusable Products notes that the company's cups and lids were designed to offer the benefits of reusability without compromising on comfort and functionality. The company is proud to be part of the Borrow Cup initiative and hopes that the cups will be well-received by consumers, contributing to the success and future expansion of the project.

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New chemical recycling plant by Xycle to be built in Rotterdam

Xycle, a company specializing in advanced chemical recycling technology, has secured strategic funding from a prestigious consortium of investors, including Dow, ING, Invest-NL, Polestar Capital, and Vopak. The funds will be used for the construction of the company's first commercial plant, which will be located in the Port of Rotterdam. This facility will process 21,000 tons of hard-to-recycle plastic waste annually, with operations expected to begin in the fourth quarter of 2026. Xycle's innovative low-temperature pyrolysis technology enables the conversion of plastic waste, which would typically end up in landfills or incinerators, into high-value pyrolytic oil. This product can be used as a raw material for producing plastics of a quality comparable to virgin materials, suitable for industries such as food packaging, medical, and automotive sectors. The strategic location of the plant in Rotterdam provides access to an extensive logistics infrastructure, making the transportation of raw materials and distribution of the finished pyrolytic oil more efficient. Additionally, Rotterdam serves as an ideal hub for servicing key European markets. The design of the Xycle facility will be based on modular technology, allowing for flexible adjustments in production to meet current market demands. In the future, the company plans to expand by building additional plants with processing capacities of up to 100,000 tons per year. The investment from the consortium, which includes Dow and other reputable investors, marks a milestone in Xycle's development. It will enable the company to effectively scale its operations and accelerate the achievement of goals related to implementing a circular economy and producing sustainable materials.

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LyondellBasell and Covestro shut down PO11 facility

LyondellBasell and Covestro have decided to close their joint facility in Maasvlakte, Netherlands, which produced propylene oxide and styrene monomer (POSM). This decision is caused by a global oversupply, increasing import from Asia, and high production costs in Europe. POSM (Propylene Oxide-Styrene Monomer) is a co-production process for propylene oxide (PO) and styrene monomer (SM). Propylene oxide is a key raw material for the production of polyurethanes, while styrene monomer is primarily used in the production of polystyrene, ABS copolymers, and other styrenic materials. The PO11 facility in Maasvlakte was one of the largest of its kind in Europe, and its closure may affect the regional chemical raw materials market. Aaron Ledet, Vice President of Innovation and Supply Chain at LyondellBasell, emphasized that while the decision to shut down the PO11 facility was difficult, it was necessary to ensure that all company plants strategically align with its long-term goals. The company is focusing on those that provide a technological advantage and support its circularity strategy. LyondellBasell is also maintaining dialogue with employees, trade unions, and other stakeholders to minimize the impact of the decision. Hermann-Josef Dörholt, Head of Performance Materials at Covestro, pointed out that as part of their "Sustainable Future" strategy, Covestro aims to optimally position itself as a reliable partner for customers and a competitive player in a challenging market. Together with LyondellBasell, they recognized that the continued operation of PO11 was no longer economically justified. At the same time, Covestro remains committed to the European market and will continue to deliver its products. The Maasvlakte facility has been in operation since 2003 as a joint venture between LyondellBasell and Covestro. The decommissioning process and dismantling of the facility are expected to be completed by 2026. The decision to close PO11 is part of a broader restructuring trend in the European chemical industry. High energy and raw material costs are causing companies to scale back operations in Europe in favor of more competitive regions, such as Asia and North America. This may lead to changes in the availability of raw materials for the production of polyurethanes and styrenic materials. Propylene oxide is an essential ingredient in polyurethane foams, used in furniture and construction, among other industries. A decline in European production may result in an increased reliance on imports and potential price changes for raw materials in the region. LyondellBasell is currently conducting a strategic analysis of its European assets in the olefin, polyolefin, and intermediate products segments. As part of this process, the company is considering various sce-

narios, including the sale of certain plants. However, no final decisions have been made regarding the future of other European facilities.

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Huntsman, Räder-Vogel re-invent the wheel

Global chemicals company Huntsman has developed a new generation of polyurethane-based, anti-static Pevotec wheels in collaboration with wheel and castor manufacturer Räder-Vogel. The wheels are made from Huntsman's Tecnothane hot-cast elastomers and are specifically designed for trolleys, carts, pulleys, and automatically guided vehicles (AGVs) used in industrial environments. Static accumulation in wheels can lead to a number of problems in manufacturing environments, including painful shocks to personnel handling equipment or moving carts; damage to a vehicle's electrical components; attraction of dust and particles, which can cause contamination issues in the semiconductor, healthcare, and biotechnology manufacturing sectors where control of particulates is crucial ; and loss of traction and malfunctions in automated equipment. Räder-Vogel's Pevotec anti-static wheels help to mitigate these issues and come in hardnesses ranging from 55 to 97 shore A, with custom configurations also available. Huntsman and Räder-Vogel, who have collaborated for 25 years, have developed a novel range of anti-static wheels that offer huge benefits across a variety of industries. This project is in line with their history of pushing the boundaries of what's possible in the world of wheels and castors. The long-standing collaboration is based on trust and mutual respect, with Räder-Vogel's high standards and commitment to quality helping it become one of the world's leading manufacturers of pallet rollers, press-on tires, and swivel and fixed castors. Huntsman's Tecnothane range is an advanced portfolio of polyurethane-based, hot-cast, engineering elastomers, which includes a full range of polyols and chain extenders. Over the years, Huntsman has blended these raw materials together in different combinations, creating a suite of elastomer formulations for a variety of different applications.

https://www.plasticstoday.com/

Borealis adds transparent thermoforming material for packaging applications to portfolio

Borealis is expanding its thermoforming portfolio with the addition of HC609TF, a high-stiffness polypropylene (PP) homopolymer designed for packaging applications. According to the company, the material offers a combination of transparency, enhanced stiffness, and processability, making it an option for products that demand both performance and aesthetics. The introduction of Borealis HC609TF also supports a circular economy, aligning with the company's commitment to sustainable living. The company said that HC609TF was engineered to meet the needs of thermoformed applications, including trays, cups, and containers. The material's increased stiffness ensures strong and durable end products, while its high transparency achieves the desired aesthetic. Additionally, its processability allows for up to a 10% reduction in cycle times, improving manufacturing efficiency. Moreover, the company noted that a feature of the material is its full recyclability, both through mechanical and chemical methods. This makes it suitable for reusable packaging structures, contributing to a reduction in waste and supporting a more sustainable future for packaging. According to Borealis, its HC609TF is in line with its mission to accelerate the transition to a circular economy for plastics. With growing pressure on manufacturers to balance performance and sustainability, the company noted that Borealis HC609TF is an option that meets both demands. It enables the production of durable, aesthetically pleasing packaging that is also recyclable and reusable, helping customers meet their sustainability goals while delivering high-quality applications.

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ProAmpac unveils sustainable moisture-protection packaging

ProAmpac has expanded its ProActive Intelligence platform by introducing new solutions to the Moisture Protect series. The new offering includes a range of moisture-absorbing films developed in collaboration with Aptar CSP Technologies. These innovations aim to enhance product protection while meeting sustainability requirements. For years, flexible packaging based on foil has been the gold standard for moisture protection, providing excellent barrier properties and helping to maintain product integrity. However, increasing demand for more eco-friendly solutions has led ProAmpac to develop new packaging options. In response to this need, the Moisture Protect series now includes both foil-based (MP-1000) and foil-free (MP-2000 and MP-3000) options. This allows customers to choose the solution that best meets their moisture protection and sustainability requirements. The MP-2000 series is a foil-free option that provides the same moisture adsorption capacity and performance as the MP-1000 series. Meanwhile, the MP-3000 series, based on a mono-polyolefin structure, is designed with recyclability in mind and offers improved product stability compared to traditional foil-based packaging. Each solution in the Moisture Protect series incorporates Aptar CSP Technologies' 3-Phase Activ-Polymer technology, which is integrated into the film structure. This approach to moisture protection eliminates the need for traditional desiccant packets. As a result, the packaging process is simplified, the number of required components is reduced, production efficiency is improved, and product shelf life is extended. These new solutions also meet consumer and regulatory expectations for sustainable packaging.

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TECHNICAL NEWS

Borealis introduces rLLDPE granulate with 85% post-consumer recycled content

Borealis is launching Borcycle M CWT120CL – a high-performance variant of recycled linear low-density polyethylene (rLLDPE), designed to support the circular economy in the area of non-food flexible packaging. This material is composed of 85% post-consumer recycled (PCR) content and 15% LLDPE additive that enhances its functional properties, making it ideal for advanced applications where sustainability and circularity are crucial. This new rLLDPE variant is the latest product in the Borcycle M line – Borealis's mechanical recycling technology that allows for the production of high-quality materials in an energy-efficient way. Creating an LLDPE variant with 85% post-consumer recycled content represents a significant technological achievement and a milestone in Borealis's EverMinds ambitions to accelerate the transition to a circular economy. Borcycle M CWT120CL is specifically designed for film extrusion and is used in primary, secondary, and tertiary packaging. Key applications include stretch films, shrink hoods, and films for agricultural, industrial, and protective uses. By reducing the carbon footprint of end products, the new rLLDPE helps Borealis's customers meet their sustainability goals and promotes the use of more eco-friendly packaging solutions. This material was developed in collaboration with Ecoplast – a member of the Borealis Group – as part of a project that began in late 2022. The market introduction of the product in January 2025 is the result of over two years of work overcoming challenges related to using a high percentage of recycled material while meeting the high quality standards required for flexible packaging. The outcome is a material with exceptional stretchability, achieved through a low gel content, and an excellent balance between stiffness and tear resistance. These properties make it an ideal solution for packaging manufacturers who aim to meet or exceed the requirements of the EU Packaging and Packaging Waste Regulation (PPWR) without compromising on performance. Peter Voortmans, Borealis's Commercial Director for Consumer Flexible Products, emphasized that the new rLLDPE variant, with its impressive 85% post-consumer recycled content, marked a significant step towards achieving a circular economy for plastics. He further explained that Borcycle M CWT120CL would help customers achieve their sustainability goals while meeting the demanding performance requirements advanced flexible packaging applications. This is one of the ways Borealis is redefining the foundations of sustainable living.

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Longer-lasting tires with eco-friendly antioxidant

Lanxess is introducing a new rubber additive – Vulkanox HS Scopeblue, which supports tire manufacturers in producing more sustainable and durable products while achieving their environmental goals. This antioxidant, developed by the specialty chemicals company, is an eco-friendly version of the proven aging stabilizer Vulkanox HS (TMQ), which protects tires from the harmful effects of oxygen and high temperatures. It stands out for its low volatility and minimal tendency to migrate. Compared to its conventional counterpart, Vulkanox HS Scopeblue has a carbon footprint that is over 30 percent lower. The reduction in CO_2 emissions has been achieved through the use of bio-circular acetone and renewable energy in the production process. The product is manufactured in a German plant certified by ISCC PLUS. Since its chemical structure remains unchanged, no modifications are required in the tire production process – it can be used as a direct replacement for a more sustainable manufacturing process. Vulkanox HS Scopeblue is part of the Lanxess Scopeblue brand, which identifies products with an exceptionally low carbon footprint or a high proportion of recycled raw materials. Dr. Holger Graf, Head of the Functional Tire Additives business unit at Rhein Chemie, a division of Lanxess, explained that with Vulkanox HS Scopeblue, they had developed another product that enables their customers to manufacture tires in a more sustainable manner, while also responding to the growing demand for eco-friendly materials. He added that this antioxidant extended tire lifespan while simultaneously reducing their environmental footprint.

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Berry introduces high-quality PCR plastic for packaging

Berry Global is launching a new high-quality post-consumer recycled (PCR) polymer for the production of packaging materials not intended for contact with sensitive products. This new material is aimed at the household and industrial chemicals packaging market. The company uses several existing processes from its patented PCR packaging materials for sensitive products, enabling the CleanStream Home and Industrial range to be suitable for a wide variety of applications with demanding technical specifications. The purity level of the recycled polymer allows it to be used in higher proportions across all types of packaging and in areas requiring high functional performance, such as trigger pumps,

dispensers, as well as lids and handles for paint containers. Mark Roberts, Director of Circular Economy for Berry's Consumer Products International division, explains that much of the current industrial recycling production, which is not intended for sensitive product contact, is used to manufacture items such as flowerpots, drainage and dewatering parts, automotive components, and furniture. However, the growing demand for more sustainable packaging, coupled with ambitious sustainability commitments and goals from their customers, has led to a need for higher-purity recyclates that are suitable for more demanding applications, and which can also maximize the use of PCR content in packaging. Thus, CleanStream Home and Industrial has been introduced to provide high-quality packaging that meets important requirements for aesthetics, safety, and functionality. One of the key advantages of the CleanStream process is that it can operate within existing waste management infrastructure. This enables the creation of a closed-loop system that ensures a more reliable and consistent supply chain. The CleanStream process replaces simple material sorting with a multi-stage solution that incorporates artificial intelligence, including automatic identification, sorting, and sanitizing. The result is a polymer with an exceptionally high purity level. Berry's production facility in Leamington Spa, UK, is able to process nearly 40% of all PP plastic packaging collected from household recycling bins, producing recycled material at scale with a significantly smaller carbon footprint. A life cycle analysis conducted by Quantis revealed that packaging made using the CleanStream process has about 35% lower carbon dioxide (CO_2) emissions compared to virgin plastics, resulting in a reduction of approximately 36,000 tons of CO_2 annually. This equates to the production of around 26 million five-liter paint containers. According to the Voice of the Industry: Sustainability Survey by Euromonitor, 60% of global corporations plan to introduce new products with sustainability packaging claims. Furthermore, the Sustainability Quarterly SKU Count and Price Tracker recorded a 13% increase in the number of SKUs with such claims in the global laundry care segment from Q4 2022 to Q4 2023. Mark Roberts notes that the demand for high-quality polymers for non-sensitive products will continue to grow in the household and industrial chemicals markets. Berry look forward to working with customers to develop packaging with a high level of PCR and deliver solutions that operate in a closed-loop system, with no compromises in performance.

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BASF: first biomass balance-based PESU

BASF has introduced Ultrason E 2010 BMB, the world's first polyethersulfone (PESU) based on a sustainable biomass balance. This innovative solution replaces 50% of fossil raw materials with renewable materials derived from organic waste, which corresponds to 39% biomass content in the final product. This process is certified according to the ISCC PLUS standard, ensuring the reliability of CO2 emissions reduction data and the transparency of the entire production chain. Thanks to the use of biomass and 100% green energy at the production facility in Ludwigshafen, Ultrason E 2010 BMB has a significantly lower carbon footprint compared to BASF's standard material. The new PESU retains the same mechanical properties, quality, and certifications as its standard counterpart, making it a drop-in solution. This means that customers can easily integrate it into their production processes without the need for machine modifications or requalification of products. As a result, it allows for a quick and efficient transition to more sustainable raw materials while maintaining high-quality standards. Erik Gubbels, from BASF's Global Business Development for Ultrason, emphasized that BASF was the first company to offer biomass-based sustainable polyethersulfone. He added that BASF's goal was to support customers in their transformation toward more circular solutions. Ultrason E 2010 BMB is widely used in various industries, such as automotive, electronics, household appliances, medical devices, and the production of reusable packaging. It is ideal for producing bottles for both adults and children, microwaveable containers, automotive parts, medical devices, and electronic components. Its exceptional mechanical properties and high-temperature resistance make it a suitable replacement for metals, ceramics, and thermosetting plastics, further contributing to reducing product weight and their carbon footprint. BASF also offers digital tools to calculate the carbon footprint of products on a cradle-to-gate basis. The application allows customers to track emissions associated with raw material acquisition, production processes, and energy consumption. This enables customers to better assess the environmental impact of their products and make decisions regarding further optimization of production processes. The introduction of Ultrason E 2010 BMB is a significant step in BASF's strategy, which aims to increase the share of renewable raw materials and reduce CO_2 emissions across the entire product lifecycle. By doing so, the company supports global sustainability goals and strives for climate neutrality.

https://tworzywa.online/

Ergis produces ultra-barrier films for Saule Technologies

Saule Technologies S.A. has announced the completion of an important phase of research and development collaboration with Ergis Sp. z o.o. – the launch of production of advanced ultra-barrier films. These films, which are transparent conducting electrodes on flexible polymer substrates, have wide applications, particularly in advanced electronics. Thanks to the agreement, the Ergis Group will be able to sell these products under its own brand "Ergis noDiffusion" for six years, allowing it

to enter new markets. For Saule S.A., this represents an opportunity to reduce dependency on external suppliers and lower the cost of perovskite panel production, potentially accelerating the development of this technology. At the same time, Saule retains exclusive rights to use these films in photovoltaic applications. Ultra-barrier films stand out for their excellent protective properties against oxygen and moisture, as well as their transparency, conductivity, and flexibility. This makes them very versatile and applicable not only in photovoltaics but also in other fields of advanced electronics and optoelectronics. Under the agreement, the Ergis Group will supply these films to Saule S.A. at an agreed price. Additionally, Saule will receive 10% of the revenue from the sale of these products by Ergis and will retain all intellectual property rights generated during the collaboration. Furthermore, compensation for the right of first refusal to the license has been set at PLN 4.5 million net. This amount will be recognized as Saule's revenue in the first quarter of 2025. The realization of this project was made possible with the support of the National Centre for Research and Development and co-financing from the European Regional Development Fund under the Operational Program Smart Growth 2014-2020. The total budget exceeded PLN 13.6 million, with over PLN 9.5 million coming from EU funds. The project focused on the development of a transparent, flexible electrode with barrier properties for applications in optoelectronics and lasted from April 2017 to September 2022. Thanks to this collaboration, Saule S.A. will gain greater independence from external suppliers of specialized materials, which should lead to lower production costs for perovskite panels. For the Ergis Group, this is also a step forward – introducing innovative films to the portfolio may strengthen its position in the advanced plastics market. The joint implementation of this project is an example of how Polish companies can effectively collaborate in the development of modern technologies, using support from EU funds.

https://tworzywa.online/

NatureWorks' extend platform boosts BOPLA efficiency and biodegradability

NatureWorks has introduced its new Ingeo Extend platform to improve the performance of its Ingeo biopolymer products. This innovation is designed to speed up the biodegradation and disintegration of biobased Ingeo PLA, making it more efficient for large-scale commercial use. The Ingeo Extend grades are said to compost up to eight times faster than standard PLA versions and can be mixed with other Ingeo PLA types to further boost biodegradation and disintegration. The first product in the Ingeo Extend range is Ingeo Extend 4950D, a PLA polymer aimed at improving the efficiency of biaxially oriented polylactic acid (BOPLA) films, which are used for packaging, while also reducing production costs. This material allows to increase stretch ratio of up to seven times in the transverse direction and can be used with other Ingeo PLA grades to optimize film production on equipment typically used for biaxially oriented polypropylene (BOPP). As a result, it helps reduce the cost of producing BOPLA films. These films break down faster than regular Ingeo PLA films, depending on the blend, and also enhance sealing performance, especially in co-extruded film structures where it can be used in sealing layers at up to 15%. Ingeo Extend 4950D films offer high heat resistance (130–140°C), excellent clarity, and strong mechanical properties like low shrinkage. Roger Tambay, Chief Growth Officer at NatureWorks, explained that brand owners and film manufacturers often wanted lower-cost biaxial films for compostable food packaging. Ingeo Extend 4950D films are ideal for replacing small-format food packaging made from hard-to-recycle materials like polypropylene. He added that small-format packaging is better suited for composting rather than recycling, and this new platform allows for larger-scale production, making it easier to replace fossil-based plastics with compostable bio-based materials. The rise of extended producer responsibility (EPR) regulations in the US and the European Union's Packaging and Packaging Waste Regulation (PPWR) has increased demand for compostable films, particularly for food packaging, to help meet waste diversion goals. NatureWorks noted that its Ingeo Extend platform will support the production of cost-effective compostable packaging for hard-to-recycle items with food residue, such as condiment packets, snack wrappers, salad bags, and lids for containers like creamers, coffee pods, and sauce cups. Compostable packaging also helps divert food waste from landfills, reducing environmental impact. Replacing fossil-based plastics with biopolymers lowers the carbon footprint of packaging by an average of 73%. Moreover, food waste in landfills is a major contributor to global methane emissions. Composting this waste reduces methane release and creates nutrient-rich soil that aids carbon capture. Finally, a study by Hydra Marine Sciences confirms that Ingeo PLA does not contribute to persistent microplastic pollution in the environment.

https://www.plasticstoday.com/

mgr Mateusz Borkowski

WYNALAZKI / INVENTIONS

Kompozycja polimerowa o zwiększonej odporności na starzenie pod wpływem promieniowania UV – Anna Marzec, Małgorzata Kuśmierek, Bolesław Szadkowski (Zgłoszenie Nr 445513, Politechnika Łódzka)

Przedmiotem zgłoszenia jest kompozycja polimerowa o zwiększonej odporności na starzenie pod wpływem promieniowania UV, zawierająca kopolimer etylenowo-norbornenowy i substancję przeciwstarzeniową, jako substancję przeciwstarzeniową i jednocześnie nadającą barwę kompozycji zawiera fusy kawy lub herbaty zmodyfikowane 3-(aminopropylo)trietoksysilanem), przy czym kompozycja zawiera 1–10 części mas. zmodyfikowanych fusów kawy lub herbaty na 100 części mas. kopolimeru etylenowo-norbornenowego (wg Biul. Urz. Pat. 2024, nr 2, 9).

Sposób wytarzania spoiwa do kompozytów ligno-celulozowych – Waldemar Perdoch (Zgłoszenie Nr 445526, Uniwersytet Przyrodniczy w Poznaniu)

Zgłoszenie dotyczy sposobu wytwarzania spoiwa do kompozytów ligno-celulozowych w jakim do naczynia z wodą wyposażonego w mieszadło mechaniczne i termometr wprowadza się oczyszczoną skrobię w ilości 1–50% w stosunku do masy wody dysperguje w wodzie, miesza i ogrzewa do 40°C, następnie dodaje się rozcieńczony kwas siarkowy (stężenie 70%) w ilości do obniżenia pH dyspersji do 2,0. Następnie do naczynia z mieszadłem wprowadza się roztwór aldehydu glutarowego (stężenie 50%) w ilości 30–70% w stosunku do ilości wody i miesza się go w temperaturze 55–85°C przez 16 godzin, a następnie zobojętnia się 5% roztworem węglanu sodu do pH 6,5 i rozdziela przez filtrację. Przesączony produkt ponownie zawiesza się w wodzie w temperaturze 45°C, dyspersję miesza się przez co najmniej godzinę i filtruje, a potem suszy się w temp. co najmniej 60±5°C do wilgotności poniżej 3% i przechowuje się w lodówce do czasu wytworzenia kompozytu ligno-celulozowego (wg Biul. Urz. Pat. 2024, nr 2, 9).

Sposób biodegradacji piór pochodzących z przetwórstwa drobiu – Olga Marchut-Mikołajczyk, Katarzyna Struszczyk-Świta, Piotr Drożdżyński, Paweł Marcinkowski, Aleksandra Nadziejko, Magdalena Rodziewicz (Zgłoszenie Nr 445600, Politechnika Łódzka)

Wynalazek dotyczy sposobu biodegradacji piór pochodzących z przetwórstwa drobiu charakteryzujący się tym, że szczep Gordonia alkanivorans S7 uaktywnia się na skosach agarowych zawierających w procentach mas.: 0,5% peptonu, 1% ekstraktu drożdżowego, 1% chlorku sodu, 2,5% agaru, wodę destylowaną do 100%, o pH skorygowanym do 6,8 za pomocą 1 M NaOH. Następnie hoduje się na tym podłożu inokulum w temp. 30°C w czasie 20–24 h, zmywa się wyhodowaną biomasę za pomocą sterylnej soli fizjologicznej, finalnie uzyskując OD600 1,8–2,0. Kolejno zaszczepia się otrzymanym inokulum w ilości 2% objętościowych płynne podłoże hodowlane zawierające w składzie w procentach mas.: 0,02% siarczanu magnezu siedmiokrotnie uwodnionego, 0,02% chlorku wapnia bezwodnego, 1% diwodorofosforanu potasu, 1% wodorofosforanu dipotasu, 1% azotanu amonu, 0,005% chlorku żelaza, 1–5% s.m. piór pochodzących z przetwórstwa drobiu wysterylizowanych w temperaturze 121°C, w czasie 15 minut, oraz wodę destylowaną do 100%, o pH skorygowanym do 6,8 za pomocą 1 M NaOH. Podłoże sterylizuje się w temp. 121°C, w czasie 15 minut i prowadzi hodowlę w czasie 96–168 h, przy stopniu wypełnienia zbiornika 20–30% objętościowych, utrzymując temp. 30°C i mieszanie o szybkości obrotów 100–160 obr./min, a następnie dokonuje separacji przez filtrację na przegrodzie celulozowej biomasy i cząstek stałych pozostałych po hodowli (wg Biul. Urz. Pat. 2024, nr 3, 12).

Sposób otrzymywania folii chitozanowych, zwłaszcza do zastosowania w przemyśle opakowaniowym – Gabriela Dudek, Nowotarski Michał (Zgłoszenie Nr 445629, Politechnika Śląska, Gliwice)

Przedmiotem zgłoszenia jest sposób otrzymywania folii chitozanowych, polegający na tym, że stosuje się wodny roztwór kwasu octowego lub cytrynowego lub mlekowego o stężeniu 88–99,9%, 7,5–30 ml kwasu, co stanowi 0,5–2,0% w stosunku do wody destylowanej, miesza mechanicznie w czasie od 2 minut do 5 minut, dodaje od 15 g do 30 g chitozanu o masie cząsteczkowej 50000-190000 Da i kontynuuje mieszanie przez 15–30 h, następnie dodaje się 2,5–9,0 g plastyfikatora (korzystnie glicerolu lub sorbitolu, który stanowi 10–40% mas. w stosunku do suchej masy polimeru), tak uzyskaną mieszaninę pozostawia się na mieszadle przez 30–120 minut, schładza w temp. 1–5°C na 8–18 h, wylewa do formy, suszy w temp. 20–25°C czasie 48–60 h. Następnie folię poddaje się rozciąganiu przy użyciu roztworu chlorku sodu (NaCl) o stężeniu 0,5–5,0% mas., który zalewa się i pozostawia na folii na czas 3–6 minut, po czym przemywa się 3–10-krotnie wodą destylowaną, suszy w czasie 3–6 h w temp. 20–25°C (wg Biul. Urz. Pat. 2024, nr 3, 13).

Nawóz organiczno-mineralny z mechanicznego przetworzenia bioodpadów – Jean Bernard Diatta (Zgłoszenie Nr 445681, BIOSTRA Sp. z o.o., Katowice)

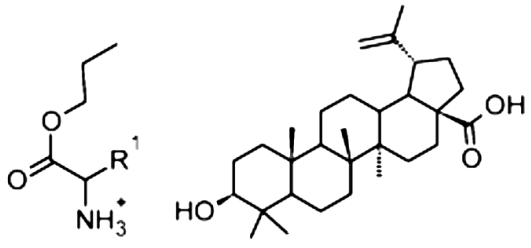
Wynalazek dotyczy nawozu organiczno-mineralnego wytwarzanego w wyniku mechanicznego przetwo-

rzenia bioodpadów, stosowanego do wzbogacania gleb uprawnych w substancje organiczne i mineralne oraz do rewitalizacji i regenerowania gleb zdegradowanych w celu stworzenia lepszych warunków wzrostu dla roślin. Nawóz organiczno-mineralny z mechanicznego przetworzenia bioodpadów, stanowi w odniesieniu do 100 cz. mas. nawozu: 40–70 cz. mas. (korzystnie 50 cz. mas.) mechanicznie drobno zmielonej masy z komunalnych odpadów biodegradowalnych zbieranych selektywnie o wielkości cząstek 0,05–25 mm (korzystnie 20 mm) i zawartości wody 40–80% (korzystnie 70%), 5–15 cz. mas. (korzystnie 15 cz. mas.) mineralnego regulatora pH tlenku wapnia o zawartości wody 2,5–15,0% (korzystnie 10%), 5–10 cz. mas. (korzystnie 10 cz. mas.) stabilizatora organicznego, którym jest słoma ze zbóż o wielkości cząstek 1,5–25,0 mm (korzystnie 20 mm) i zawartości wody 10–25% (korzystnie 20%), 10–25 cz. mas. (korzystnie 10 cz. mas.) ligninowo-celulozowego sorbentu organicznego trocin drzew liściastych i/lub trocin drzew iglastych o wielkości cząstek 1–15 mm (korzystnie 10 mm) i zawartości wody 15–30% (korzystnie 25%), 5–20 cz. mas. (korzystnie 10 cz. mas.) stabilizatora mineralnego siarczanu wapnia, o zawartości wody 5–15% (korzystnie 15%) (wg Biul. Urz. Pat. 2024, nr 4, 10).

Aminokwasowa pochodna kwasu betulinowego i sposób wytwarzania aminokwasowej pochodnej pochodnej kwasu betulinowego – Paula Ossowicz-Rupniewska, Joanna Klebeko, Maya Guncheva (Zgłoszenie Nr 445638, Zachodniopomorski Uniwersytet

Technologiczny w Szczecinie)

Zgłoszenie dotyczy aminokwasowej pochodnej kwasu betulinowego charakteryzującego się tym, że ma postać o wzorze (I), gdzie R stanowi łańcuch boczny na atomie węgla α, L-aminokwasu, a część kationową stanowi ester etylowy aminokwasu, zaś część anionową stanowi anion betulinianowy. Przedmiotem wynalazku jest też sposób wytwarzania aminokwasowej pochodnej kwasu betulinowego, według wynalazku, charakteryzującego się tym, że ester etylowy aminokwasu poddaje się reakcji z kwasem 3β-hydroksy-20(29)-lupen-28-owym w ilości równomolowej, w środowisku rozpuszczalnika organicznego w temp. 25–35°C w czasie 5–45 minut wytwarzając pochodną o wzorze (I) (wg Biul. Urz. Pat. 2024, nr 4, 11).



(I)

Sposób wytwarzania wielowarstwowej folii na bazie skrobi termoplastycznej i przędzonego polilaktydu – Weronika Janik, Gabriela Dudek, Anna Wojtala, Jolanta Grittner (Zgłoszenie Nr 445667, Sieć Badawcza Łukasiewicz - Instytut Ciężkiej Syntezy Organicznej „BLACHOWNIA", Kędzierzyn-Koźle; Politechnika Śląska, Gliwice)

Wynalazek dotyczy sposobu wytwarzania wielowarstwowej folii na bazie skrobi termoplastycznej i przędzonego polilaktydu, polegający na tym, że w temp. 60–85°C przez 8–25 min, z szybkością 10–60 obrotów na minutę miesza się 55–63,0 cg/g skrobi o zawartości amylozy 10–35 cg/g oraz 30–34,0 cg/g plastyfikatora. Po 4–15 min mieszania wprowadza się jeszcze 3–15,0 cg/g oksydowanej sacharozy i kontynuuje mieszanie przez 4–17 min. Uzyskaną mieszaninę poddaje się plastyfikacji w temp. 90–180°C i uzyskuje się skrobię termoplastyczną. TPS układa się na arkuszu elektroprzędzonego polilaktydu, prowadzi się prasowanie i uzyskuje folię dwuwarstwową. Grubość warstwy przędzonego polilaktydu w folii dwuwarstwowej wynosi 12–16 μm, a pozostałą część stanowi warstwa skrobi termoplastycznej o grubości 250–450 μm (wg Biul. Urz. Pat. 2025, nr 4, 11).

Sposób otrzymywania granulowanego poli((met) akrylanu metylu) – Andrzej Milewski, Michał Rabiej (Zgłoszenie Nr 445746, Politechnika Śląska, Gliwice)

Przedmiotem zgłoszenia jest sposób otrzymywania granulowanego poli((met)akrylanu metylu), polegający na tym, że 5–12,5 g poli((met)akrylanu metylu), (korzystnie 10 g) rozpuszcza się odpowiednio w 37,5–45cm^3 (korzystnie 40 cm^3) rozpuszczalnika glimowego w temp. 45–95°C (korzystnie 90°C), otrzymując odpowiednio roztwór polimeru o stężeniu 10–25% mas. (korzystnie 20% mas.), odparowuje monomer pod ciśnieniem 35–80 mbar w temp. 45°C. Następnie poddaje granulacji mieszaninie dwóch rozpuszczalników: nie protonowego i niepolarnego rozpuszczalnika alifatycznego C-5–C-8, z którym korzystnie miesza się polarny organiczny rozpuszczalnik niskocząsteczkowy C-1–C-3, schładza do temp. 20°C, po czym wkrapla roztwór polimeru przy szybkości mieszania 80–800 rpm (korzystnie 250 rpm) oraz intensywnością wkraplania równą 0,2–5 kropli na sekundę (korzystnie 2 krople na sekundę) przy czasie granulacji nie krótszym niż 10 sekund do 24 h (korzystnie 10 min), mieszaninę dekantuje, granulat suszy pod zmniejszonym ciśnieniem 2–10 mbar (korzystnie 6 mbar) w temp. 20–25°C (korzystnie 20°C) (wg Biul. Urz. Pat. 2025, nr 5, 19).

Kompozyt na bazie tworzywa kompostowalnego i biodegradowalnego z napełniaczem w postaci pyłu mineralnego oraz sposób wytwarzania kompozytu na bazie tworzywa kompostowalnego i biodegradowalnego z napełniaczem w postaci pyłu mineralnego – Arkadiusz Pawlik (Zgłoszenie Nr 445733, Pawlik Arkadiusz, Mojęcice)

Wynalazek dotyczy kompozytu na bazie tworzywa kompostowalnego i biodegradowalnego z napełniaczem w postaci pyłu mineralnego do produkcji wyrobów z tworzyw kompostowalnych i biodegradowalnych. Składa się z 20–69% mas. osnowy ze znanego tworzywa kompostowalnego i biodegradowalnego ze skrobi termoplastycznej oraz dodatku 80–31% mas. napełniacza w postaci pyłu mineralnego rozdrobnionego na frakcje pyliste o średnicy ziarna 0,01–0,069 mm, przy czym napełniacz w postaci pyłu mineralnego ma skład przedstawiony w tabeli. Przedmiotem zgłoszenia jest też sposób wytwarzania kompozytu na bazie tworzywa kompostowalnego i biodegradowalnego z napełniaczem w postaci pyłu mineralnego (wg Biul. Urz. Pat. 2025, nr 5, 17).

Pierwiastek	Zawartość % mas. w dodatku
SiO_2 – krzemionka	45–47
Al_2O_3 – tlenek glinu	13,9–14,3
Fe_2O_3 – tlenek żelaza	11–12
CaO – tlenek wapnia	9–10
Na_2O – tlenek sodu	3,1–3,5
MgO – tlenek magnezu	7,9–12
K_2O – tlenek potasu	0,8–0,9
Ti_2O – tlenek tytanu	1,5–2,2
P_4O_{10} – dekatlenek tetrafosforu	0,45–0,68
Mn_2O_3 – tlenek manganu (III)	0,25–0,35

Sposób otrzymywania biodegradowalnych otoczek na bazie chitozanu do nawozów azotowych oraz kompozycja na bazie chitozanu – Ilona Wandzik, Danuta Gillner, Agata Wawoczny, Regina Michalik, Jarosław Janik, Gracjan Rożański (Zgłoszenie Nr 445793, Politechnika Śląska, Gliwice; Grupa Azoty Zakłady Azotowe Kędzierzyn S.A., Kędzierzyn-Koźle)

Przedmiotem zgłoszenia jest kompozycja chitozanowa z dodatkiem mieszaniny eutektycznej, charakteryzująca się tym, że zawiera 5–30% mas. mieszaniny eutektycznej powstałej ze zmieszania i ogrzewania w temp. 60–90°C chlorku cynku i glikolu etylenowego, w stosunku molowym 1:4-1:6. Zgłoszenie obejmuje także sposób otrzymywania biodegradowalnych otoczek na bazie chitozanu do nawozów azotowych, polegający na tym, że do roztworu chitozanu w roztworze kwasu octowego o stężeniu 1–5% w/v dodaje się metodą rozpuszczalnikową 5–30% mas. schłodzonej mieszaniny głęboko eutektycznej otrzymanej przez zmieszanie i ogrzewanie w temp. 60–90°C chlorku cynku i glikolu etylenowego, do osiągnięcia stanu jednorodnej cieczy. Całość miesza się w czasie 2–6 h w temp. pokojowej, po czym natryskuje na granule nawozu saletrzanego o wielkości granul 1–6 mm w urządzeniu fluidyzacyjnym, w temp. 40–60°C, przy przepływie powietrza 300–600 m^3/h, przepływie cieczy roboczej 0,7–2,5 l/h, suszy w złożu fluidalnym w czasie 15–45 min (wg Biul. Urz. Pat. 2025, nr 6, 10).

Kompozycja polimerowa przeznaczona na wyroby o podwyższonej odporności na utlenianie i podatne na kompostowanie – Małgorzata Latos-Brozio, Anna Masek, Dominik Dusza, Wiktoria Kowalczyk, Aleksandra Wdowiak (Zgłoszenie Nr 445762, Politechnika Łódzka)

Wynalazkiem jest kompozycja polimerowa przeznaczona na wyroby o podwyższonej odporności na utlenianie i podatne na kompostowanie, zwłaszcza w przydomowych kompostownikach, zawierająca polilaktyd oraz odpady roślinne, jako odpady roślinne zawiera wysuszone i zmielone wytłoki z jabłek lub aronii, w ilości 5–15 cz. mas. na 100 cz. mas. polimeru (wg Biul. Urz. Pat. 2025, nr 6, 13).

Kompozyt na osnowie polilaktydu modyfikowany pochodnymi sferokrzemianowymi z grupami fluoroalkilowymi i sposób jego wytwarzania – Bogna Sztorch, Robert Przekop, Roksana Konieczna, Daria Pakuła, Julia Głowacka, Bogdan Marciniec (Zgłoszenie Nr 445796, Uniwersytet im. Adama Mickiewicza w Poznaniu)

Zgłoszenie dotyczy kompozytu na osnowie polilaktydu modyfikowanego pochodnymi sferokrzemianowymi z grupami fluoroalkilowymi. Kompozyt w osnowie polilaktydu modyfikowany pochodnymi sferokrzemianowymi z grupami fluoroalkilowymi składa się z 95–99,90% mas. polilaktydu i 5–0,10% mas. modyfikatora krzemoorganicznego (korzystnie 98,50–99,75% mas. polilaktydu i 1,5–0,25% mas. modyfikatora krzemoorganicznego), gdzie modyfikatorem jest OSS-2OFP:2OCT:4AGE, albo OSS-3OFP:3OCT: 2AGE, albo OSS-4OFP:2OCT:2AGE, albo OSS-3OFP:3OCT:2TMOS. Zgłoszenie dotyczy również sposobu wytwarzania kompozytu w postaci koncentratu, polegający na tym, że polilaktyd podgrzewa się powyżej temperatury mięknienia do uzyskania polimeru w stanie uplastycznionym, dalej do 95,00% mas. polilaktydu dodaje się 5% mas. modyfikatora krzemoorganicznego, otrzymanego w wyniku katalitycznej reakcji hydrosililowania oktawodorosferokrzemianu z olefinami: eterem allilowo-2,2,3,3,4,4,5,5-oktafluoropentylowym OFP, oktenem OCT oraz eterem allilowo-glicydylowym AGE dodanych w zmiennych stosunkach molowych, w obecności katalizatora oraz w obecności toluenu, mieszając 24–48 godzin. Następnie polimer wraz z modyfikatorem homogenizuje się do uzyskania jednorodnej masy, dalej studzi się, granuluje i suszy w podwyższonej temperaturze (wg Biul. Urz. Pat. 2025, nr 6, 13).

mgr inż. Małgorzata Choroś

NEW BOOKS

NEW BOOKS

HANDBOOK OF NEAR-INFRARED ANALYSIS

Editors: Emil W. Ciurczak, Benoît Igne, Jerome Workman Jr., Donald A. Burns (CRC Press)

4th edition, 2025, 938 pages, 89.99 GBP

ISBN 9780367684532

ISBN 9781351269889 (e-Book)

Rapid, inexpensive, and easy-to-deploy, near-infrared (NIR) spectroscopy can be used to analyze samples of virtually any composition, origin, and condition. The handbook explores the factors necessary to perform accurate and time- and cost-effective analyses across a growing spectrum of disciplines. This updated and expanded edition incorporates the latest advances in instrumentation, computerization, chemometrics applied to NIR spectroscopy, and method development in NIR spectroscopy, and shows current trends in sample preparation, calibration transfer, process control, data analysis, instrument performance testing, and commercial NIR instrumentation. This work offers readers an unparalleled combination of theoretical foundations, cutting-edge applications, and practical experience. It also explains how to perform accurate as well as time- and cost-effective analyses, reviews software-enabled chemometric methods and other trends in data analysis, highlights novel applications in pharmaceuticals, polymers, plastics, petrochemicals, textiles, foods and beverages, baked products, agricultural products, biomedicine, nutraceuticals, and counterfeit detection. The publication explains current trends in sample preparation, calibration transfer, process control, data analysis, and multiple aspects of commercial NIR instrumentation. Offering the most complete single-source guide of its kind, the handbook, continues to offer practicing chemists and spectroscopists an unparalleled combination of theoretical foundations, cutting-edge applications, and detailed practical experience provided firsthand by more than 50 experts in the field.

ADDITIVE MANUFACTURING AND 3D PRINTING TECHNOLOGY

Principles and Applications

G.K. Awari, C.S. Thorat, Vishwjeet Ambade, D.P. Kothari (CRC Press)

1st edition, 2025, 309 pages, 45.99 GBP

ISBN 9780367697549

ISBN 9781003013853 (e-Book)

This book consists of the construction and working details of all modern additive manufacturing and 3D-printing technology processes and machines, while also including the fundamentals, for a well-rounded educational experience. The book is written to help the reader understand the fundamentals of the systems. This publication provides a selection of additive manufacturing techniques suitable for near-term application with enough technical background to understand the domain, its applicability, and to consider variations to suit technical and organizational constraints. It highlights new innovative 3D-printing systems, presents a view of 4D printing, and promotes a vision of additive manufacturing and applications toward modern manufacturing engineering practices. With the block diagrams, self-explanatory figures, chapter exercises, and photographs of lab-developed prototypes, along with case studies, this new textbook will be useful to students studying courses in mechanics, production, design, mechatronics, and electrical engineering.

SMART WAYS OF BIOMATERIAL DESIGNING SYNTHESIS AND CHARACTERIZATION

Prospects of Enhanced Application From Labs to Clinics

Editors: Arvind K. Singh Chandel, Arpana Parihar, Raju Khan (CRC Press)

1st edition, 2025, 336 pages, 150.00 GBP

ISBN 9781032306780

ISBN 9781003306245 (e-Book)

This book explores the design, synthesis, and characterization of natural and synthetic polymeric biomaterials for diverse biomedical applications, including drug delivery, tissue engineering, and antimicrobial coatings. It highlights advances in polymer chemistry, offering insights into the modification of polymers' properties to meet biomedical challenges. The book provides detailed strategies for material design and characterization, addressing practical issues faced by researchers. It also covers crucial aspects such as materials-tissue interaction, sterilization prior to in vivo use, and the characterization of biomaterials for development. Serving as a comprehensive guide for students, researchers, and professionals in the biomedical field, this book aims to bridge the gap between laboratory research and clinical applications.

THE ELEMENTS OF POLYMER SCIENCE AND ENGINEERING

Alfred Rudin, Phillip Choi (Elsevier)

4th Edition, 2025, 608 pages, 139 EUR

ISBN 9780323906494

ISBN 9780323917117 (e-Book)

Fourth edition of this book updates on the field of polymers, which has advanced considerably since the book's last publication. A key feature of this new edition is the

inclusion of new and updated content on such concepts as multifunctional polymers, bioderived polymers, computation modeling, polymer sustainability, and newer manufacturing methods like 3D printing. Improvements to the book's pedagogy include the addition of more worked examples, more end-of-chapter problems, and new figures to better illustrate key concepts. This book is ideal for advanced undergraduate and graduate students in physics, chemistry, chemical engineering, and anyone in related courses. This edition has also been reorganized to become more aligned with how instructors currently teach the course. It is ideal for one- or two-semester introductory courses in polymer science and engineering taught primarily to senior undergraduate and first-year graduate students in a variety of disciplines, but primarily chemical engineering and materials science.

TRIBOLOGY IN SUSTAINABLE COMPOSITES

Jitendra Kumar Katiyar, Mohammed Abdul Samad (CRC Press)

1st edition, 2025, 106 pages, 44.99 GBP

ISBN 9781032220413

ISBN 9781003270966 (e-Book)

Tribological performance of sustainable composites depend upon external parameters such as interface and environmental temperature, contact pressure and behavior of contact materials at interface and others. This book covers sustainable composites and bio- composites in terms of proper selection of reinforcements, methods to improve the thermal and mechanical properties, techniques for uniform dispersion of the reinforcements and their tribological performance. Also, it details the testing and damage characterization methods of these sustainable composites. This publication presents fundamental knowledge of sustainable composites, including chemical composition, structural features and fabrication techniques, while providing an analytical overview of the different types of characterization techniques and tribological methods. It also provides an extensive review on bio- composite properties and their tribological performance for biomedical application. The book contains extensive reviews on cutting- edge research on lightweight materials for future applications in a variety of industries and their tribological performance. It provides the application of sustainable composites in various fields such as aerospace, automobile, medical etc. This book is aimed for researchers, professionals and graduate students of tribology, composites, mechanical engineering and materials engineering.

NANOENGINEERED MATERIALS FOR MEDICAL AND HEALTHCARE APPLICATIONS

Editors: Radhakrishnan Edayileveettil Krishnankutty, Ashitha Jose, Visakh P. M. (Wiley)

1st edition, 2025, 384 pages, 168.99 EUR

ISBN 9781119791645

ISBN 9781119792178 (e-Book)

This book is a comprehensive guide on the new-generation nanoengineered materials' contribution to the ongoing development of medical devices and other healthcare applications. Nanotechnology has revolutionized cutting-edge medical approaches, including gene therapy, targeted drug delivery, treatment of various chronic and genetic diseases, cancer diagnosis and treatment modalities, and more, leading to the establishment of personalized treatment regimens. The book reports on various nanoparticles, such as metallic and non-metallic nanoparticles, nano-micelles, liposomal nanoparticles, and polymer nanoparticles, being used in various aspects of medical and healthcare applications. In addition, novel natural product-based nanomaterials and nanomaterial complexes are also detailed, showing their potential applications. The impact of nanotechnology on promoting bone regeneration and serving as novel dental implants is investigated, along with its applications in skincare. The book highlights the crucial role that nanotechnology plays in the development of various antimicrobial materials and surfaces, which are being used in the medical sector, including numerous types of wound healing materials, antimicrobial textiles, and PPEs, as well as face masks and gloves. The book concludes with a chapter on nano-coated medical devices. This will be a valuable source of information for researchers, engineers, and scientists in materials science, nanotechnology, and bioengineering working in the biomedical and bioscience areas and industries.

COMPOSITES-BASED PEROVSKITE SOLAR CELLS

Yoon-Bong Hahn, Yousheng Wang, Tahmineh Mahmoudi (Wiley)

1st edition, 2025, 256 pages, 124.99 EUR

ISBN 9783527844548

ISBN 9783527844531 (e-Book)

Composite materials combine two or more materials with distinct chemical properties. These composites can improve on design flexibility, specialization of properties, chemical resistance, and other advantages relative to traditional materials. Perovskite solar cells based on composite materials might therefore acquire the capacity to solve a range of critical issues. This publication offers an overview of these cells, their properties, and their applications. Beginning with an introduction to the fundamental principles of perovskite solar cell construction, the book surveys different configurations, stability issues, and much more. The result is a one-stop shop for anyone looking to understand these potentially critical tools in the fight for a sustainable energy grid. Readers will also find methods for fabricating perovskite-based solar cells, detailed discussion of Pb-perovskites and Pb-free perovskites, composites-based materials in tandem solar cells, and many more. This book gives unique perspective from which to revisit approaches developed in the community of materials scientists. The book is ideal

for surface physicists and chemists, solid state physicists and chemists, electrical engineers, and materials scientists of all kinds.

NANOTECHNOLOGY FOR SUSTAINABLE FOOD PACKAGING

Editors: C. Anandharamakrishnan, Jeyan A. Moses, M. Maria Leena (Wiley)

1st edition, 2025, 480 pages, 161.60 EUR

ISBN 9781119875123

ISBN 9781119875147 (e-Book)

Latest techniques for the development of biodegradable food packaging casings with commentary on safety concerns and regulatory frameworks. This book covers the latest techniques and applications of nanotechnology, demonstrating capabilities to revolutionize the food packaging sector. This includes concepts of biodegradable food packaging, approaches to improve material functionality, robust sensing systems, and the scope of employing advanced analytical and computational approaches to support progress in the field. The text focuses on the United Nations Sustainable Development Goals, including life cycle analyses, biodegradability, green practices, eco-friendliness, and sustainability. This publication explores the major food packaging matrixes (polymers, edible films, and multilayers), different categories of advances (composites, active and intelligent packaging), labeling considerations, region- and country-specific regulatory frameworks, and safety concerns. Readers will also find a futuristic preview of this rapidly advancing field and an overview of lab-ready technologies with the potential for commercialization. Written by a team of highly qualified authors, discusses sample topics including nanotechnology's potential to improve the shelf life of food products, the chemistry and functionality of different materials based on advantages and possible challenges. It also discusses sources, chemistry, and functionality of various bio-based sources and their usage as nanocomposites, bio-based alternatives, drawbacks, and research trends. Bioactive compounds in food packaging and their benefits, preparation methods, characterization approaches, delivery, and assessment are also mentioned. Readers can expand their knowledge on surface modification approaches through sustainable physico-chemical approaches, and the development of flexible packaging materials suitable for specific requirements such as non-thermal processing. The book is an essential scientific and technological reference for scientists and R&D personnel who are interested in advancing food packaging technologies. The book is also valuable for students, researchers, and food industry professionals studying nanotechnology in food, food packaging, and food science and technology.

BAMBOO-BASED POLYMER COMPOSITES
Fundamentals, Properties, Applications and Performance

Editors: N. M. Nurazzi, S. M. Sapuan, Mohd Nor Faiz Norrrahim (Elsevier)

1st edition, 2025, 500 pages, 201.44 EUR

ISBN 9780443334450

ISBN 9780443334467 (e-Book)

This book presents the latest developments in this important research field. The book begins with a thorough introduction to bamboo resources, bamboo anatomy, its growth origin, and the extraction process used to obtain the fiber. Following sections cover polymer composites, the fabrication process and performance, and new progress in the isolation and functionalization of nanocellulose-based bamboo, chemical modification, manufacturing techniques, and structure-property relationships. This comprehensive resource on topics presented provides insights into potential applications for structural, construction and building materials. This publication contains various case studies on concept generation, materials selection, methodology, characterization, and performance analysis to illustrate how these innovations can be applied in practice. It also covers economic aspects, social and environmental concerns, lifecycle assessments, and future prospects. This book solves the need for an integrated approach, with multidisciplinary working teams discussed in detail. This will be a valuable source of information about bamboo-based composites for academic and industrial researchers, materials scientists and engineers, chemists, environmental scientists, product manufacturers and all those involved in the development of sustainable composite materials.

mgr Mateusz Borkowski