WITRYNA

OBRONA PRACY DOKTORSKIEJ

Dr Malwina Niedźwiedź – *absolwentka Uniwersytetu Marii Curie-Skłodowskiej w Lublinie, Wydziału Chemii. W 2024 r. ukończyła Szkołę Doktorską na Zachodniopomorskim Uniwersytecie Technologicznym w Szczecinie, realizując pracę doktorską w Katedrze Inżynierii Polimerów i Biomateriałów, w dziedzinie nauk inżynieryjno-technicznych, dyscyplina inżynieria materiałowa.*

Tytuł pracy doktorskiej: ***Amfifilowe i hybrydowe sieci polimerowe zawierające fibrynogen i pochodne katecholi* (*Amphiphilic and hybrid polymer networks containing fibrinogen and catechol derivatives*)**

Promotor:
– prof. dr hab. inż. Mirosława El Fray (Wydział Technologii i Inżynierii Chemicznej, Katedra Inżynierii Polimerów i Biomateriałów, Zachodniopomorski Uniwersytet Technologiczny w Szczecinie)

Promotor pomocniczy:
– dr Gokhan Demirci (Wydział Technologii i Inżynierii Chemicznej, Katedra Inżynierii Polimerów i Biomateriałów, Zachodniopomorski Uniwersytet Technologiczny w Szczecinie)

Recenzenci:
– prof. dr hab. Alina Sionkowska (Uniwersytet Mikołaja Kopernika w Toruniu)
– prof. dr hab. inż. Jadwiga Laska (Akademia Górniczo-Hutnicza im. St. Staszica, Kraków)
– dr hab. Radosław Mrówczyński, prof. UAM (Uniwersytet im. Adama Mickiewicza w Poznaniu)

Data i miejsce obrony: 15 kwietnia 2025 r., Zachodniopomorski Uniwersytet Technologiczny w Szczecinie, Wydział Technologii i Inżynierii Chemicznej.

Celem rozprawy doktorskiej było opracowanie nowych hybrydowych i amfifilowych sieci polimerowych zawierających hydrofobowy składnik na bazie roślinnych kwasów tłuszczowych, a także hydrofilowy polipeptyd, fibrynogen i pochodne katecholi.

Pierwszym etapem badań była synteza telechelicznych makromonomerów estrowo-uretanowych przy użyciu nowych, nietoksycznych katalizatorów i zbadanie ich właściwości użytkowych. Kolejnym krokiem była fotopolimeryzacja otrzymanych makrocząsteczek w celu uzyskania sieci polimerowych. Zastosowano dwa fotoinicjatory I rodzaju. Przeprowadzono szczegółowe badania kinetyki fotopolimeryzacji, na podstawie których określono wpływ stężenia inicjatora, intensywności promieniowania UV oraz atmosfery gazowej na stopień konwersji i szybkość reakcji.

Dzięki zastosowaniu mieszaniny rozpuszczalników otrzymano hybrydowe, syntetyczno-naturalne sieci polimerowe, zawierające także jednostki katecholowe. Pomiary kąta zwilżania, przeprowadzone metodą osadzonej kropli wody i dijodometanu, potwierdziły amfifilowy charakter otrzymanych układów. Podczas badań zaobserwowano również zjawisko reorganizacji struktury powierzchniowej sieci polimerowej. Analiza DSC wykazała przejście szkliste poniżej temperatury pokojowej oraz doskonałą kompatybilność składników układu. Niska temperatura zeszklenia miała wpływ na właściwości układu. Materiał charakteryzował się właściwościami mechanicznymi zbliżonymi do właściwości tkanek miękkich, w szczególności dużą elastycznością (mały moduł sprężystości).

Kluczowym aspektem badań było również określenie wpływu grup katecholowych na właściwości adhezyjne powstałych materiałów. W przypadku obecności katecholi, w teście odrywania folii polimerowej od powierzchni hydrofilowej, zaobserwowano zwiększenie siły oddziaływania na granicy faz (większa siła odrywania) w porównaniu z polimerem bez katecholu.

Otrzymane hybrydowe sieci polimerowe ulegały degradacji enzymatycznej pod wpływem proteazy. Proces hydrolizy przyśpieszała obecność składników biologicznych, takich jak fibrynogen i katechol. Proteaza zwiększała również rozpad łańcuchów poliuretanowych w porównaniu z degradacją prowadzoną w obecności samego buforu.

Wyniki badań fizyko-chemicznych i brak cytotoksyczności wskazują na potencjalną przydatność nowych układów polimerowych do zastosowań w inżynierii tkanek miękkich.

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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 llutym 2024 r.

T a b e l a 1. Produkcja surowców i półproduktów chemicznych w luty 2025 r., t
T a b l e 1. Production (tons) of raw materials and chemical intermediates in February 2025

Artykuł	Średnia miesięczna w 2024 r.	Luty 2025 r.	Razem I–II 2025 r.	% I–II 2025/ I–II 2025
Węgiel kamienny	3 685 345	3 587 671	7 631 402	96,9
Węgiel brunatny	3 418 819	3 958 487	7 890 704	118,1
Ropa naftowa – wydobycie w kraju	50 587	52 480	113 091	99,9
Gaz ziemny – wydobycie w kraju (tys. m^3)	402 935	431 102	911 754	99,4
Etylen	28 610	23 237	45 966	77,2
Propylen	32 222	33 940	66 440	118,7
1,3-Butadien	4 393	5 015	9 120	95,9
Fenol	3 148	3 301	6 730	89,0
Izocyjaniany	238	257	491	111,8
ε-Kaprolaktam	8 617	7 923	16 221	100,3

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T a b e l a 2. Produkcja najważniejszych tworzyw polimerowych i polimerów w lutym 2025 r., t
T a b l e 2. Production (tons) of major polymer materials and polymers in February 2025

Tworzywo polimerowe/polimer	Średnia miesięczna w 2024 r.	Luty 2025 r.	Razem I–II 2025 r.	% I–II 2025/ I–II 2025
Tworzywa polimerowe	261 577	259 753	517 171	97,1
Polietylen	26 062	26 123	48 876	89,4
Polimery styrenu	12 449	14 192	26 583	107,4
Poli(chlorek winylu) niezmieszany z innymi substancjami, w formach podstawowych	17 594	10 200	22 650	64,0
Poli(chlorek winylu) nieuplastyczniony, zmieszany z dowolną substancją, w formach podstawowych	3 322	3 779	6 723	99,3
Poli(chlorek winylu) uplastyczniony, zmieszany z dowolną substancją, w formach podstawowych	8 205	9 089	16 900	95,6
Poliacetale, w formach podstawowych	19	4	16	45,7
Glikole polietylenowe i alkohole polieterowe, w formach podstawowych	7 488	7 329	14 451	91,7
Żywice epoksydowe, w formach podstawowych	931	1 198	1 976	109,9
Poliwęglany	1 531	1 628	3 365	96,9
Żywice alkidowe, w formach podstawowych	2 031	2 760	5 106	108,0
Poliestry nienasycone, w formach podstawowych	7 654	6 575	13 184	89,0
Poliestry pozostałe	4 899	5 831	10 936	113,4
Polipropylen	25 693	36 841	66 476	134,4
Polimery octanu winylu w dyspersji wodnej	3 618	4 025	7 675	104,8
Poliamidy 6; 11; 12; 66; 69; 610; 612, w formach podstawowych	17 116	18 389	37 423	99,3
Aminoplasty	20 365	20 305	44 585	107,3
Poliuretany	1 689	1 651	3 635	121,9
Kauczuki syntetyczne	22 309	22 727	48 092	111,8

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T a b e l a 3. Produkcja wybranych wyrobów z tworzyw polimerowych w lutym 2025 r.
T a b l e 3. Production of some polymer products in February 2025

Wyrób	Jednostka	Średnia miesięczna w 2024 r.	Luty 2025 r.	Razem I–II 2025 r.	% I–II 2025/ I–II 2025
Wyroby z tworzyw polimerowych	tys. zł	6 828 748	6 533 899	13 134 803	97,2
Rury, przewody i węże sztywne z tworzyw polimerowych	t	27 420	27 241	50 933	107,3
w tym: rury, przewody i węże z polimerów etylenu	t	10 481	10 672	19 600	106,2
rury, przewody i węże z polimerów chlorku winylu	t	8 693	8 990	16 537	128,7
Wyposażenie z tworzyw polimerowych do rur i przewodów	t	4 342	4 410	8 512	109,2
Płyty, arkusze, folie, taśmy i pasy z polimerów etylenu, o grubości < 0,125 mm	t	52 127	59 059	115 839	102,0
Płyty, arkusze, folie, taśmy i pasy z polimerów propylenu, o grubości ≤ 0,10 mm	t	14 183	13 272	27 610	106,9
Płyty, arkusze, folie, taśmy i pasy z komórkowych polimerów styrenu	t	37 884	31 805	63 374	103,5
w tym: do zewnętrznego ocieplania ścian	t tys. m²	13 115 8 858	11 026 7 552	21 818 14 889	99,2 99,2
Worki i torby z polimerów etylenu i innych	t	27 059	26 286	53 839	101,4
Pudełka, skrzynki, klatki i podobne artykuły z tworzyw polimerowych	t	24 293	24 614	48 488	102,0
Pokrycia podłogowe (wykładziny), ścienne, sufitowe	t tys. m²	8 903 2 183	9 208 2 207	18 835 4 448	110,2 98,4
Drzwi, okna, ościeżnice drzwiowe	t tys. szt.	46 097 805	39 499 731	75 649 1 398	98,6 101,0
Okładziny ścienne, zewnętrzne	t tys. m²	299 107	236 50	433 97	123,4 183,0
Kleje na bazie żywic syntetycznych	t	6 472	8 398	17 206	207,4
Kleje poliuretanowe	t	1 492	1 610	3 093	106,7
Włókna chemiczne	t	2 863	2 908	5 860	110,5
Tkaniny kordowe (oponowe) z włókien syntetycznych	t tys. m²	1 332 4 251	1 189 3 795	2 654 8 471	126,0 125,6
Nici do szycia z włókien chemicznych	t	13	36	73	84,8

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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 2024 r.	Luty 2025 r.	Razem I–II 2025 r.	% I–II 2025/ I–II 2025
Wyroby z gumy, produkcja wytworzona	t	75 520	75 414	14 989	89,3
Opony i dętki z gumy; bieżnikowane i regenerowane opony z gumy	t tys. szt.	37 666 4 574	38 005 4 748	71 907 9 456	90,3 100,1
w tym: opony do samochodów osobowych	tys. szt.	2 246	2 326	4 212	98,1
opony do samochodów ciężarowych i autobusów	tys. szt.	245	302	606	130,4
opony do ciągników	tys. szt.	6	5	10	86,7
opony do maszyn rolniczych	tys. szt.	29	39	79	136,7
Przewody giętkie wzmocnione metalem	t	1 435	1 280	2 472	77,2
Taśmy przenośnikowe	t km	3 206 2 370	3 055 2 457	5 864 4 785	77,4 100,6

Wg danych GUS.

mgr inż. Małgorzata Choroś

Another unplanned shutdown at Anwil sparks concerns in the Central European PVC market

An unexpected stop in PVC production at Anwil's Włocławek facility—part of the Orlen Group—is raising new alarms across the plastics processing industry in Central and Eastern Europe. The shutdown, which began in early May, comes without any official explanation or timeframe for resumption, intensifying uncertainty for downstream users. Anwil remains the only producer of PVC in Poland and a critical supplier in the region, with an annual production capacity of approximately 340,000 tonnes. The lack of clarity around the cause and duration of the shutdown poses a serious challenge for procurement planning and supply chain stability across the industry. This marks the second major operational disruption at Anwil in recent months. In February 2025, a fire at the same site stopped the production of PVC and other chemical products for over a month. Although operations resumed in late March, the market has yet to fully recover from the supply shock, and price volatility remains a problem. Beyond PVC, Anwil is also a key producer of caustic soda and nitrogen fertilizers, making every operational interruption a broader concern for Poland's chemical sector and raw material security. Industry reports are already speculating on the potential impact this latest disruption may have on procurement strategies and investment decisions among plastics processors across the region. Anwil's key role in the European supply chain means that any prolonged downtime could lead to renewed upward pressure on prices and force importers to seek alternative sources from more distant markets. If the shutdown continues, its effects are expected to extend well beyond May and could significantly affect the PVC market throughout Q2 2025. For Polish processors, the current situation underscores the need for cautious stock planning and the exploration of diversified sourcing strategies.

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Andrzej Skolmowski appointed acting CEO of Grupa Azoty

On May 12, 2025, Andrzej Skolmowski was appointed acting CEO of Grupa Azoty following the resignation of Adam Leszkiewicz, who took over leadership at Polska Grupa Zbrojeniowa. Skolmowski returns to a managerial role in the group during a critical period requiring decisive corrective actions. Since March 2024, he has served as Grupa Azoty's Vice President responsible for finance, controlling, corporate risk, cybersecurity, and investor relations. Previously, from 2009 to 2016, he was also Vice President, leading merger and acquisition processes and financial strategy. Skolmowski's experience extends beyond chemicals to biotechnology and technology sectors, including projects in artificial intelligence and cloud computing. He holds degrees from the John Paul II Catholic University of Lublin (KUL), doctoral studies at the Warsaw School of Economics (SGH), and completed the Advanced Management Program at IESE Business School in Barcelona. His appointment comes as Grupa Azoty faces the consequences of unstable raw material markets in Europe and a slowdown in the fertilizer and chemical sectors. These challenges affected the company's 2023 financial results, but the management continues to execute a multi-phase profitability improvement plan. Key focus areas include cost optimization, asset review, strengthening financial institution relationships, and building a long-term financial foundation. The new CEO emphasizes the need to stabilize finances and rebuild the group's investment capacity, highlighting liquidity management, operational efficiency improvements, and revisiting development plans in industrial chemicals and plastics. For Polish processors, the priority will be whether the new management can restore supply predictability and provide more stable cooperation conditions.

https://tworzywa.online/

European chemical industry at a crossroads — Poland stands out positively

Numerous data indicate that the chemical industry in Europe is losing momentum. According to the latest Cefic report, chemical production on the continent is expected to grow by only 0.5% in 2025, marking a clear slowdown compared to last year's +2.4% growth. Among the few bright spots is Poland, which shows positive performance. The beginning of 2025 brought no improvement for the European chemical sector. Both cost pressures and weak demand show no signs of easing. Rising trade tensions, including new US tariffs, further increase structural challenges in the industry. Chemical production in the EU-27 declined by 0.3% in Q1 2025 compared to the same period in 2024 and remains 9.1% below the average pre-crisis levels from 2014 to 2019. The 0.9% increase in sales value mainly resulted from price increases—averaging 1.1% in 2024—rather than real production growth. In this troubling landscape, Poland performs relatively well. According to Cefic's "Chemical Trends Report Q1 2025," Poland recorded a 3.8% increase in production—one of the best results in the EU, alongside Belgium (+9.1%). By comparison, Germany and Italy saw growth below 0.5%, while France (-5.5%), the Netherlands (-6.1%), and Spain (-0.5%) experienced declines. Capacity utilization in the European chemical sector dropped to 74% in Q1 2025, well below the long-term EU average of 81.4% and also being behind the US, where the industry has operated more efficiently since late 2022. This reflects a chronic mismatch between production capacity and current demand, a problem unresolved for over two years. One of the key factors weakening Europe's competitiveness is the high price of natural gas, currently 3.3 times higher than in the United States. For energy-intensive sectors like chemicals—especially plastics processing—this

drastically reduces production profitability. Moreover, foreign trade conditions are worsening. Although the EU recorded a seemingly high trade surplus in 2024, it mainly resulted from weakened domestic demand and reduced imports. This trend reversed in early 2025, with the trade surplus falling by 25% to €6.7 billion in just the first two months. Meanwhile, chemical imports grew by 10.2%. Cefic warns that the European chemical industry stands at a crossroads. Structural reforms are urgently needed to restore competitiveness, including changes in energy and trade policies, simplification of regulations, and the creation of investment incentives.

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MOCAP opens new warehouse in Poland to strengthen EU market operations

MOCAP, a global leader in plastic, rubber, and masking product solutions, has opened a new European warehouse in Żerniki, Greater Poland Voivodeship (Poznań). This strategic move is a key step in the company's ongoing expansion across the European market, reflecting its commitment to fast and reliable deliveries for its growing customer base in the EU. Located in a major European logistics hub, the Żerniki facility allows for faster and more efficient distribution throughout Poland and the entire EU. Thanks to large stock levels of MOCAP's most popular products—such as plastic caps, plugs, grips, masking components, and packaging—the new warehouse significantly enhances the company's ability to meet customer needs, reduce order fulfillment times, and improve supply chain efficiency. By establishing local inventory and offering quicker delivery times, MOCAP aims to provide more flexible customer service across Europe. The increasing demand for its products in the region confirms that this investment is a crucial part of the company's long-term strategy for the European Union market. In addition to the new warehouse, MOCAP operates a manufacturing plant in the United Kingdom and maintains an extensive distribution network throughout Europe.

https://www.plastech.pl/

WTH continues its operations in Poland

WTH has been operating since 1992, specializing in the sale of additives and chemical raw materials for processing plastics, rubber, paints, coatings, and adhesives. The company serves several hundred clients across Europe and has been present in Poland for 16 years, steadily increasing its involvement. Its headquarters are located in Stade, near the seaports of Hamburg and Bremen, enabling global and flexible operations. Founded by Walter Thieme and managed since 2021 by his son Gero Thieme, WTH has offered a wide range of additives and technical consulting in Poland for over fifteen years. The offer is also directed to producers of seals, duroplasts, and the textile industry. The largest product group consists of flame retardants such as aluminum hydroxides, melamine-based flame retardants, ammonium polyphosphates, and modern phosphorus-containing flame retardants. Additionally, WTH provides fillers, processing aids, impact modifiers, plasticizers, UV stabilizers, antioxidants, optical brighteners, waxes, and many others, available in various forms. To ensure the highest quality, WTH has developed its own brands. The trademark "WTH" has been registered in the European Union since 2010, and the brand "Addforce" was created and registered in 2013. These designations guarantee customers consistent and high product quality. Cooperation with carefully selected suppliers helps to avoid quality fluctuations, as quality, alongside with reliability and durability, is key to the company's success. WTH focuses on developing highly specialized product groups within the European market, reflecting its market position built over more than thirty years of global activity. The company uses the strengths of its manufacturers and knows where its competitive advantages lie. The Addforce FR APP products are widely used in polyurethane applications, including foams. WTH's ammonium polyphosphates find applications in adhesives and sealants, polypropylene copolymers and blends, cellulose materials, duroplasts (including unsaturated polyesters, phenolic, and epoxy resins), as well as in textile finishing and electronics. A recent sales hit is the Addforce FR APP201A type, which is also a significant new addition to WTH's ammonium polyphosphate portfolio. Recently, WTH GmbH strengthened its sales representation in Poland, placing special emphasis on the "Paints, Coatings and Varnishes" departments. The company aims to increase its activity in Poland and Eastern Europe, seeing great potential for sustainable growth thanks to its knowledge, readiness, and new employees. Since the paints and coatings sector in Poland lacks dedicated professional trade fairs, WTH strives to reach producers directly. The full range of flame retardants and low-dose additives—optical brighteners, UV stabilizers, photoinitiators—is now available as a comprehensive WTH offering for this industry. With a more individualized approach to selected additive groups and market segments, WTH expects positive growth in its turnover in Poland in the coming years. Thanks to reputable suppliers, high-quality products, a large client base, and professional technical consulting, the company looks optimistically toward further sustainable development.

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SolidPlast strengthens market position through digital assistance systems

Founded in 2014 and located in Kartuzy near Gdańsk, SolidPlast stands out thanks to its strategic implementation of digital assistance systems. On an increasingly competitive market, the company relies not only on modern injection molding machines but also on intelli-

gent process control, with ENGEL's iQ digital assistance systems leading the way. Operating 17 injection molding machines, SolidPlast manufactures technically advanced plastic components for clients such as Aptiv, Avery Dennison, and Apator-Metrix. The main challenges include maintaining high component quality, short cycle times, and maximum energy efficiency, all under continuous cost pressure. A specific project prompted SolidPlast to implement the iQ hold control system. In 2022, a long-term key client commissioned the serial production of a new component— a gas meter housing made of POM. The demands were high: short cycle time, strong dimensional stability, and consistent quality. At the same time, the company lacked machines with sufficient clamping force to operate the large tool conventionally. The solution combined experience, clever machine design, and digital tools. After detailed analysis, SolidPlast chose the ENGEL victory 220 machine— a column-less, precise unit with a small footprint. Thanks to the iQ clamp control program, the required clamping force was accurately calculated and confirmed. This system measures the so-called "mold breathing" and optimally adjusts the clamping force. In spring 2023, ENGEL proposed a new solution: the implementation of iQ hold control, an intelligent assistance system that optimizes the holding pressure time during the injection molding process. The software monitors the real-time solidification of the material in the mold cavity and automatically adjusts the holding time accordingly. The results were immediately noticeable. SolidPlast increased machine utilization, achieving an 11% productivity boost on this specific production. Normally, cycle time reduction carries the risk of deteriorating part quality and dimensional stability, but the intelligent process management showed its strength here. The outcome was zero quality losses, stable processes, and a reduction in serial production costs by about 4.2%. SolidPlast pursues a clear strategy: digitization is not an add-on but an integral part of production. ENGEL's iQ systems enable the company to respond faster, more efficiently, and more sustainably to customer demands without compromising quality. SolidPlast demonstrates how medium-sized plastics processors can maintain a market advantage through well-thought-out use of digital assistance systems. Thanks to iQ hold control, the company significantly shortened cycle times, increased productivity, ensured quality, and lowered production costs. Combined with iQ clamp control and iQ process observer, SolidPlast created a finely tuned system that saves not only time but also energy and resources.

https://www.plastech.pl/

M. Sc. Mateusz Borkowski

WORLD NEWS

Coca-Cola revises its recycling statements

The beverage giant's updated environmental communication may set a new standard for plastic packaging labeling across Europe. In response to increasing pressure from the European Commission and consumer organizations, Coca-Cola announced that would stop the use of the slogan "100% recycled plastic" on its PET bottles. The recycling message will also be adjusted, changing from the previous "Recycle me again" to a more realistic "Recycle me." These new labels are expected to appear on packaging within the coming months. This marketing communication adjustment comes directly after a complaint filed in November 2023 by a network of EU consumer organizations. The complaint accused Coca-Cola of greenwashing–misleading consumers about the environmental attributes of its products, specifically plastic packaging. Although the PET bottle itself may indeed be made from recycled material, the labels and caps are still produced from virgin raw materials. Given this incomplete information, the claim "100% recycled" was regarded as potentially misleading for consumers. The change in communication strategy is not due to a legal violation, as clarified by the European Commission, but is a voluntary move aligned with broader European efforts to increase transparency in environmental statements. The implementation of the new labeling will be monitored by the Consumer Protection Cooperation (CPC) network, which operates across all 27 EU member states. In its official statement, Coca-Cola emphasized that these voluntary commitments reflect shared ambitions with the CPC network to provide consumers with clear and reliable information. The consumer organization BEUC, which helped initiate the proceedings, welcomed Coca-Cola's decision as a positive step but called for strict oversight of the commitments' execution. The European Commission also announced plans to extend similar reviews of recycling statements to other companies within the beverage industry.

https://tworzywa.online/

Covestro acquisition approved by the European Commission

The European Commission has granted approval for the acquisition of the German chemical company Covestro by Abu Dhabi National Oil Company (Adnoc). The transaction, valued at approximately 14.7 billion euros, raised no antitrust concerns. Despite the scale of the deal, it was determined that the acquisition will not negatively affect competition within the chemical and plastics sectors. The Commission's approval marks the completion of a crucial regulatory step in the process of Covestro's takeover by the Emirati state-owned company Adnoc. The deal, initially announced in 2024, is being executed through Adnoc International Germany Holding, an entity controlled by XRG, Adnoc's foreign investment arm. During the investigation, the Commission established that Adnoc and Covestro operated at different levels of the supply chain: Adnoc supplies petrochemical raw materials, while Covestro manufactures higher value-added chemical products such as polycarbonates, polyurethanes, and isocyanate precursors. This lack of significant overlap in business activities eliminated the risk of reduced competition. Moreover, the new ownership structure is not expected to grant Adnoc a dominant market position, nor will it enable the company to restrict competitors' access to essential raw materials or final product customers. The Commission's assessment placed particular emphasis on the market positions of both companies within Europe, especially in the segments of basic chemicals and plastics intermediates. The transaction is expected to close in the second half of 2025. Upon completion, Adnoc will strengthen its footprint in the European chemical and plastics industry, expanding its activities beyond the traditional fuel sector. Analysts suggest this move may signal further investments aimed at diversifying petrochemical operations and developing advanced material products.

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Nordson BKG and Fimic announce breakthrough in recycling technology

Nordson BKG and Fimic, two well-established companies in the plastics processing industry, have announced a deepening of their cooperation aimed at delivering revolutionary technology for the recycling sector. The joint solution is scheduled to debut at the K 2025 trade fair, taking place from October 8 to 15 in Düsseldorf. Nordson BKG, part of the American Nordson Polymer Processing Systems group, specializes in producing melt pumps, screen changers, pelletizing systems, and auxiliary equipment. Fimic, an Italian manufacturer of self-cleaning filters and contamination separation systems, became the exclusive distributor of Nordson BKG products in Italy as of January 2025. This enhanced partnership between the two companies is intended to bring advanced technologies that will revolutionize plastics processing and recycling. While specific details of the project remain

confidential, both Nordson and Fimic promise a groundbreaking solution that will set new industry standards. Until now, their collaboration mainly involved leveraging Fimic's local expertise to support customers in Italy. The new strategic partnership aims to jointly develop innovative technological solutions. Although the full presentation of their work will be unveiled at the K fair, it is already clear that the companies aspire to provide a comprehensive response to current challenges in recycling—such as increasing energy efficiency, improving the quality of recovered materials, and advancing process automation.

https://tworzywa.online/

Breakthrough elastic hydrogel paves way for 3D-printed blood vessels and organs

Guohao Dai, PhD, a bioengineering professor at Northeastern University, helped create a new elastic hydrogel material for 3D printing of soft living tissues, including blood vessels. The breakthrough technology, for which he and co-inventor Yi Hong, PhD, from UT Arlington received a patent in early 2025, enables obtaining new hydrogel, that is highly elastic and appears stronger than traditional hydrogels, which are too weak and fragile to imitate and withstand human soft tissue mechanics. Dai authored a paper describing the technology as a visible-light crosslinked, single-network, elastic, and biocompatible hydrogel system based on an acrylated triblock copolymer of poly(ethylene glycol) PEG and polycaprolactone (PCL) (PEG-PCL-DA). Hydrogel usually breaks when stretched. Lab studies on this new material suggest that it can stretch to accommodate arterial pressure. But Dai said that it was not yet strong enough to make a blood vessel in humans. Animal studies are needed next to further refine the material and get it ready for human studies. In the future, the creation of 3D-printed blood vessels could make a big difference to some children with congenital heart defects. Pulmonary valve replacement is the most common heart procedure in children. Pediatric cardiac surgeons often use synthetic 3-dimentional grafts that are similar to the sizes and shapes of children's hearts at the time of surgery. Synthetic grafts, however, cannot grow with children, so these patients need multiple surgeries to replace the grafts they've outgrown. Dai anticipates that the hydrogel they've developed could be used to construct a biodegradable 3D graft in the patient's heart size and shape, which behaves like a human blood vessel and grows with the child. That's possible because the hydrogel he helped to create dissolves in a liquid solution and can encapsulate a large amount of water after printing, making the environment good for growing cells. Scientists infuse the cells into the liquid solution before printing. Once printed, they expose the object to blue light, triggering a photochemical reaction that makes the gel elastic while protecting the living cells. Cells multiply and grow inside the printed structure. Amazingly, the 3D-printed vessel or other structure eventually degrades in the body. But before it does, the child will have grown their own cells to replace the bio-printed vessel with a matrix that will eventually support the mechanical structure of the vessel. Dai said that they have submitted several grant proposals, working with John Mayer, Jr., MD, at Boston Children's Hospital. According to Dai, his laboratory is experienced with congenital pediatric patients and knows how to use pig and sheep models,. National Institutes of Health (NIH) funding is the most likely source to take this early stage of hydrogel material development to the next level. Dai said, that he and the co-inventors would welcome an industrial partnership to further the technology.

https://www.plasticstoday.com/

Maag Group acquires Sikora AG – a merger of expertise

Maag Group has signed an agreement to acquire the German company Sikora AG, recognized as a leader in measurement and inspection systems for the cable, pipe, and plastics industries. The transaction aims to accelerate the development of technologies in artificial intelligence, machine learning, and the industrial Internet of Things (IIoT). Financial details have not been disclosed. The deal is expected to be finalized in the second quarter of 2025, following the receipt of necessary regulatory approvals. Based in Bremen, Sikora employs around 450 people and operates 13 international subsidiaries. For decades, the company has invested in the development of contactless measurement systems, automatic sorting, and quality control, particularly for sectors related to plastics. The partnership with Maag Group is intended to foster the development of integrated, intelligent control systems and to increase energy efficiency in production processes. Harald Sikora, the company's founder, will remain involved as an advisor. Operational management will continue under Dr. Christian Frank (CEO) and Holger Lieder, who is responsible for global sales. Maag Group employs over 1,700 people and operates across Europe, Asia, and North America, offering solutions in pumping, filtration, granulation, recycling, and digitization of plastics processing.

https://tworzywa.online/

Saudi Arabia and Sidel sign agreement

During the official visit of Saudi Arabia's Minister of Industry and Mineral Resources to France, the Kingdom of Saudi Arabia and Sidel, a global leader in packaging solutions, signed a Memorandum of Understanding (MoU) in Paris to explore the possibility of starting operations within the Kingdom. The MoU was signed by Engineer Saleh AlSolami, CEO of the Saudi National Industrial Development Center (NIDC), representing Saudi Arabia, and Clive Smith, Executive Vice President of

Customer Management AOA at Sidel, in the presence of His Excellency Bandar Alkhorayef, Minister of Industry and Mineral Resources, and Pietro Cassani, CEO of Sidel, who witnessed the signing ceremony. This agreement reflects Saudi Arabia's strong commitment to collaborating with leading global companies to establish advanced manufacturing locally, support technology transfer, and promote the goals of the Kingdom's Vision 2030 related to industrial transformation and private sector development. The CEO of NIDC emphasized that Sidel is a global leader in packaging solutions and a valuable source of industry expertise. The partnership supports Saudi Arabia's ambition to create globally competitive industrial opportunities in strategically important sectors, welcoming partners aligned with the country's long-term vision who are ready to invest in the industrial base and workforce. The MoU includes a joint assessment of the feasibility of implementing local services and programs to meet Saudi Arabia's growing needs in the food and beverage packaging industry. This initiative is part of the broader agenda of the Minister's visit to France, which includes meetings with CEOs of Airbus, Safran, Lesaffre, and other leading French industrial entities to build strategic partnerships. Saudi Arabia remains committed to providing global investors with a reliable ecosystem of incentives and support that encourages localization, knowledge exchange, and industrial excellence.

https://www.plastech.pl/

Recyclable deodorant packaging debuts

A more sustainable approach to plastic packaging might be closer than you think — perhaps just an arm's reach away. Body care brand Every Man Jack, for instance, has introduced a 100% recyclable deodorant stick made entirely from mono-material polypropylene. The change, announced on Earth Day, is accordance with the brand's mission. The previous deodorant packaging, constructed primarily from polypropylene, also included a polyethylene carrier. This mixed-material format not only made the packaging impractical to properly separate and recycle but also complicated the development process that included a new stick design. The transition to the new packaging was a two-year journey from concept to market, according to Ted Wang, the brand's director of technical services. "Introducing our unique 'flask shape' design presented manufacturing challenges that required extensive prototyping and multiple rounds of adjustments to ensure the proper fit of all components," Wang explains. "In addition to creating a more sustainable mono-material solution, we prioritized the consumer experience. We tested and validated the new design with our community to ensure that it not only improved our environmental footprint but also delivered an exceptional user experience — and we're thrilled that our consumers love the new ergonomic shape." After use, the packaging is accepted at any municipal recycling facility that processes polypropylene (PP #5), says Wang, adding that "consumers should check with their local recycling programs to confirm acceptance. As with all recycling guidelines, the packaging should be emptied of all product residue and be free of debris before placement in the recycling bin." There's more to the brand's sustainable tale: The updated packaging is made with 50% post-consumer recycled resin that will reduce the use of virgin plastic by 500,000 pounds annually. That's an "amount more than the weight of a whale," according to the company.

https://www.plasticstoday.com/

Futamura makes condiment packaging compostable

In recent years, small sachet formats have come under instruction for the environmental challenges they pose. Commonly used to dosing condiments, sauces, personal care creams, and other liquid products, these single-use plastic envelopes offer convenience to consumers — yet present significant end-of-life issues, rendering them unrecyclable. That's beginning to change. Japan-based compostable film producer Futamura, compostable packaging supplier Repaq, and machine manufacturer GK Sondermaschinenbau (GKS) partnered to deliver a sustainable breakthrough: a fully compostable sachet. The sachet is based on Futamura's NatureFlex technology, designed to package liquid products such as ketchup, mustard, cooking sauces, and hand cream. The laminate structure combines Futamura's cellulose-based barrier film with a separate biopolymer film layer that ensures hermetic sealing. Both are certified compostable for industrial and home composting environments. The first compostable sachets are expected to enter the market soon. For liquid applications, the compostable sachets offer an oxygen transmission rate of 0.5 (at 23°C and 50% relative humidity) and a shelf life of up to 12 months. GSK reports that the machineability of these new sachets has been proven at scale, with no drop in efficiency compared to conventional plastic sachets. This performance consistency has been reported across a range of the company's machinery sizes — small, medium, and large.

https://www.plasticstoday.com/

M. Sc. Mateusz Borkowski

TECHNICAL NEWS

igus launches wear-resistant plain bearings tested for PTFE — just in time for Hannover Messe

Cologne-based motion plastics specialist igus has announced a major advancement ahead of this year's Hannover Messe: its development team has successfully manufactured polymer plain bearings from the popular iglidur G, iglidur X, and iglidur H series, now tested for the presence of PTFE. These bearings, widely used in machinery, systems, and vehicles around the globe, have been reengineered in response to growing concerns over PFAS regulations and the potential future bans on their use. Following intensive in-house research and development, igus has introduced standard-series plain bearings with PTFE-verified materials. Lars Butenschön, head of the iglidur plain bearing technology division at igus, emphasized the significance of this achievement. The company is particularly proud of the development of a PTFE-tested version of iglidur G — a globally recognized, all-purpose material known for its high wear resistance and low friction. Maintaining this versatility without relying on PTFE was a considerable challenge for the R&D team. Thanks to a tailored formulation strategy, the updated materials preserve key specifications — including temperature stability, mechanical strength, and shrinkage — with negligible deviations. These results have been validated in igus's own 4,000-square-metre test laboratory. The breakthrough reflects more than six decades of company expertise in tribologically optimized polymers. igus has also taken similar steps with other core product lines. The high-temperature-resistant iglidur X, widely used in aerospace applications, is now PTFE-tested, as is iglidur H, which is valued in marine and chemical engineering sectors for its exceptional moisture resistance. Earlier in 2024, igus eliminated PTFE from two other major material families: iglidur J and iglidur W. According to Butenschön, PTFE-free alternatives are now available for the five most widely used iglidur materials, which collectively cover around 80% of all iglidur applications worldwide. This development allows a substantial share of users to prepare for future PFAS regulations without having to modify their existing systems. In most cases, the cost of switching to the new materials remains virtually unchanged. This innovation comes at a critical time, as the European Chemicals Agency (ECHA) considers imposing strict limitations or even a total ban on PFAS — a group of substances known for their persistence in the environment and potential health risks. PFAS are commonly used in a wide range of products due to their water-, grease-, and dirt-repellent properties, from raincoats and non-stick pans to fast-food packaging. igus has historically used PTFE — a member of the PFAS family — to achieve the self-lubricating effect in its polymer plain bearings. With this new generation of tested materials, the company is offering future-proof solutions that maintain performance while supporting sustainability and compliance with evolving regulations.

https://www.plastech.pl/

Pioneering product innovations from Hasco enhance mouldmaking flexibility and efficiency

Hasco continues to expand its product range year after year, delivering new solutions aimed at optimizing design processes and increasing flexibility in mould construction. Among the latest additions to its portfolio are the durable N/… precision rough plates, developed to complement the extensive range of Hasco plates P/… (without holes) and K/… (with holes). These plates serve as versatile base materials for components such as guide elements, inserts, sliding plates, and pressure pads. Manufactured from high-grade, thermally stress-relieved steel, they offer exceptional dimensional stability and process reliability. With lengths of 500 mm and 1000 mm, the plates are tailored to meet the individual needs of modern mouldmaking. Another highlight is the Hasco H5055 plastic filter, a groundbreaking solution for demanding plastic filtration tasks. Its innovative design minimizes shear stress, helping to preserve the mechanical properties of the processed material. Specifically developed for use in injection moulding nozzles and manifold bushings, the filter is made from corrosion-resistant stainless steel and features over 1,000 angled holes. This unique structure ensures maximum filtration efficiency with minimal pressure loss. The conical geometry eliminates dead zones, making the filter both long-lasting and easy to clean. Contaminants can be removed externally, significantly reducing maintenance intervals and operating costs while improving overall production uptime and consistency. Hasco has also introduced Shadowfree technology — a major innovation in needle valve systems. This advanced system eliminates flow shadows and enables significantly faster colour changes in hot runner applications. Additively manufactured using 3D printing, the system efficiently splits and reunites the melt flow around the valve needle, providing not only a measurable reduction in pressure loss but also a gentle flow path ideal for thermally sensitive plastics. By eliminating dead spots, the system supports rapid material transitions. Rigorous testing has demonstrated colour changes from

black to white in just 25 cycles, outperforming conventional systems by a factor of three to four. This translates to reduced material waste and enhanced product quality. With these latest developments, Hasco reinforces its commitment to pushing the boundaries of toolmaking innovation, providing engineers and manufacturers with cutting-edge components that support efficient, sustainable, and high-performance production.

https://www.plastech.pl/

Konica Minolta CF-300: A new benchmark in color measurement for the plastics industry

In response to the growing complexity of quality control in the plastics industry, Konica Minolta introduces the CF-300, a stationary spectrophotometer designed to meet the increasing demands of modern production environments. As component shapes become more intricate and available measurement areas shrink, the CF-300 provides a reliable solution for highly precise, repeatable color assessments — even on the smallest surfaces. Designed for reflectance-based color measurement within the 400–700 nm wavelength range, the CF-300 operates in the widely used d/8 geometry. Equipped with 40 highly sensitive photodiodes, the device delivers measurements in 10 nm intervals. It supports both SCI (Specular Component Included) and SCE (Specular Component Excluded) modes, ensuring accurate readings across a wide variety of materials and finishes. With a color accuracy of dEab ≤ 0.15 and repeatability of dEab ≤ 0.02, the CF-300 sets a high standard for performance in its class. The instrument features two aperture sizes: a standard 8 mm and an ultra-small aperture for fields as small as 0.75 × 1.0 mm. This makes it ideal for parts previously considered unmeasurable due to size or shape. Whether measuring curved surfaces, recessed areas, or micro components, the CF-300 adapts to each challenge without compromising accuracy. Flexible in setup, the device can be used in both horizontal and vertical orientations. The vertical mode offers added security during micro-sample analysis, preventing samples from falling into the device. It also supports non-contact measurements, which is essential when working with delicate surfaces that must remain pristine – a critical advantage in the luxury goods sector, where scratches or handling marks are unacceptable. Industries such as cosmetics benefit greatly from the CF-300's capabilities. Whether testing small bottles, caps, printed plastic packaging, or makeup accessories like eyeliner pencils and applicators, the device ensures precise color consistency. The fashion industry also sees value, especially in the quality control of buttons, buckles, fasteners, and sunglasses frames. In the consumer electronics and home appliance sectors, manufacturers can rely on the CF-300 to inspect small buttons and control knobs, which often lack sufficient flat surface area for standard handheld spectrophotometers. Automotive manufacturers also benefit, particularly when evaluating small interior parts where precision and consistency are the most important. The CF-300 opens new opportunities for electronics and component suppliers, especially those producing plastic connectors, fittings, and cable housings. With the ability to measure ultra-small, flat surfaces with precision, Konica Minolta's CF-300 brings color quality control to a new level — ensuring manufacturers can meet today's expectations for accuracy, reliability, and traceability.

https://www.plastech.pl/

KraussMaffei PX electric injection molding machine – precision, efficiency, and reliability for sustainable production

As the demand for energy efficiency and sustainable manufacturing continues to grow, plastics processors are seeking solutions that are not only technologically advanced but also flexible and economical. The PX series electric injection molding machines from KraussMaffei, one of the most recognized global brands in polymer processing, meet these evolving needs. Available in Poland through Dopak, the authorized KraussMaffei representative for over 30 years, the PX machines (clamping force range: 500–4000 kN) are a response to the market's call for precise, energy-efficient, and fully electric molding technology. Dopak offers comprehensive support, including sales, service, training, and process consulting. At the core of the PX series is modern servo drive technology, ensuring ultra-quiet operation, reduced energy consumption, and extremely precise mold movements. This results in consistently high part quality and process stability. A standout feature of the PX is the MC6 control system, equipped with a glass Multitouch display. It allows full interface customization, while features such as SplitScreen and ProcessDesigner make process control intuitive. New digital capabilities, like the socialProduction app, provide real-time updates on machine status, production output, and process parameters directly to the user's smartphone. Unlike many electric machines that require additional hydraulic units to perform hydraulic functions in the mold, PX machines include an integrated servo-hydraulic unit. This compact system powers hydraulic cores, valve gates, and the ejector, enhancing the machine's versatility without sacrificing its fully electric benefits. All functions are programmable directly via the MC6 controller, simplifying operation and increasing productivity. A highlight of recent developments is The Turtle Project, unveiled at Fakuma 2024, showcasing the PX in a Multinject configuration for multi-component injection molding. In this application, a specialized nozzle was used to produce sandwich-structured parts with a recycled ABS/PC core encased in a high-quality ABS outer layer. This innovation exemplifies how KraussMaffei combines advanced technology with circular economy principles—delivering sustainability without compromising part quality. With the PX series, KraussMaffei

proves that smart engineering, energy savings, and high precision can go hand in hand—paving the way for the next generation of sustainable plastics manufacturing.

https://www.plastech.pl/

X-Rite launches CiF3200 benchtop spectrophotometer for small and challenging parts

X-Rite Incorporated, a global leader in color science and technology, has announced the launch of the CiF3200 imaging benchtop spectrophotometer. Designed to measure the color of small, irregular, multicolored, and highly reflective objects, the CiF3200 sets a new standard for precision and control in industries where accuracy is critical. With a minimum measurement area of just 2 mm, the CiF3200 enables manufacturers to define and communicate digital color standards even for the most compact components. This enhances quality control processes while reducing costly rework. It is particularly well-suited for high-detail applications in luxury goods, consumer electronics, and precision-molded plastic parts. The CiF3200 incorporates advanced features such as adjustable virtual apertures ranging from 2 to 12 mm, on-screen targeting for precise sample alignment, and automatic multi-color extraction. These capabilities allow for fast, repeatable color assessments and support data-driven, objective decision-making throughout the quality control workflow. Equipped with an integrating sphere and SPIN/SPEX functionality, the CiF3200 also enables gloss measurements—critical for assessing metallic and reflective surfaces where finish can significantly affect visual perception. Whether verifying color harmony in high-end watches or confirming consistency across intricate molded components, the CiF3200 delivers reliable results with confidence and speed. Manufacturers benefit from live preview targeting, the ability to digitally store measurement images for full traceability, and the option to extract multiple colors from a single sample for comprehensive analysis. easy integration with X-Rite's Color iQC software further streamlines operations, offering a complete, efficient solution for modern color quality control. With the CiF3200, X-Rite provides a powerful tool that meets the growing demands of industries where precision, efficiency, and color consistency are non-negotiable.

https://www.plastech.pl/

Guill introduces spiderless pipe die for extrusion

In the coming years, the global market for pipes used in irrigation/sewage systems and industrial applications is expected to grow. This is caused by the increasing need for water and wastewater infrastructure, as well as the growth of industrialisation and urbanisation. These factors are expected to increase demand for pipes in emerging economies such as China, India and Brazil, as well as in developed markets like the U.S. and Europe. Used by tube and pipe producers for larger diameter capabilities, this new pipe die can provide a finished extrusion with OD up to 4". Larger diameters upon request. It's offered in 4140 steel or stainless steel with heat treating. The company's spiderless pipe die design differentiates itself from a basket die with its focus on precision tooling gained from decades of experience in multi-layer extrusions, medical tubing, flow analysis and Guill's ISO 9001 and AS9100 (Aerospace) quality systems. The significance of the Guill Spiderless Pipe Die becomes evident when considering material savings. In general, the cost of the polymer material can range from 50% to 70% of the total cost of producing polymer pipes. The cost of other materials such as additives, fillers and reinforcements, as well as the cost of energy, labour and equipment to the total production cost. In some cases, the energy cost, particularly electricity and natural gas, can be a significant part of the total cost of production, especially for large-scale production facilities. In other cases, labour costs in regions of the world with high labour costs can significantly impact the cost of production. The cost of the raw polymer can be affected by market fluctuations in the price of oil, impacting the cost of petrochemicals used in the production of polymers. Additionally, the cost can also be influenced by supply and demand factors and global trade dynamics.

https://interplasinsights.com/

M. Sc. Mateusz Borkowski

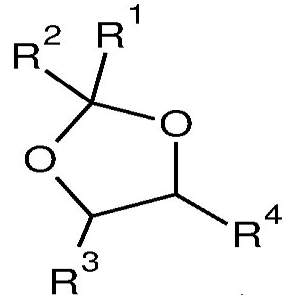
WYNALAZKI / INVENTIONS

Sposób selektywnej izolacji półprzewodnikowych, jednościennych nanorurek węglowych – Andrzej Dzienia, Dawid Janas, Patrycja Taborowska, Dominik Just (Zgłoszenie Nr 446050, Politechnika Śląska, Gliwice)

Przedmiotem zgłoszenia jest sposób selektywnej izolacji półprzewodnikowych, jednościennych nanorurek węglowych, polegający na tym, że na każde 1,5 mg naważonych nanorurek węglowych, dodaje się 4,5–15 mg selektywnego polimeru przewodzącego albo mieszaniny polimerów przewodzących selektywnego i nieselektywnego albo selektywnego polimeru i oligomeru albo polimeru i małocząsteczkowego organicznego związku dyspergującego, przy czym co najmniej jeden polimer jest selektywny względem chiralności, a sumaryczny stosunek wagowy polimerów do nanorurek węglowych wynosi od 4:1 do 8:1. Następnie do mieszaniny procesowej dodaje się 3–50 mg małocząsteczkowego dyspersanta, całość rozpuszcza w 2–5 ml rozpuszczalnika organicznego lub mieszaniny rozpuszczalników organicznych na każdy 1 mg nanorurek węglowych (korzystnie 2,65 ml na 1 mg nanorurek węglowych) poddaje wstępnej sonikacji, przy czym proces prowadzi się w temp. 0–60°C w łaźni ultradźwiękowej o mocy 200–1000 W, w czasie od 5 min do 24 h. Otrzymaną zawiesinę homogenizuje się homogenizatorem ultradźwiękowym z sonotrodą o mocy 2,5–4 W na każdy mililitr zawiesiny, w temp. 0–60°C, w czasie 5–30 min, odwirowuje co najmniej 6000xg (korzystnie 15314xg) w czasie 2–30 minut po czym 80% do 90% klarownego supernatantu, pozostały osad ponownie zalewa się świeżą porcją rozpuszczalnika organicznego lub mieszaniny rozpuszczalników organicznych i powtarza się analogicznie proces sonikacji, odwirowania i rozdziału do utraty selektywności i/lub wydajności ekstrakcji (wg Biul. Urz. Pat. 2025, nr 10, 11).

Sposób katalitycznej syntezy pochodnych 1,3-dioksolanu oraz katalizator do realizacji tego sposobu – Maciej Kapkowski, Karina Kocot (Zgłoszenie Nr 446048, Uniwersytet Śląski w Katowicach)

Zgłoszenia dotyczy sposobu katalitycznej syntezy pochodnych 1,3-dioksolanu o strukturze przedstawionej na wzorze (I), w którym poszczególne podstawniki R^1, R^2, R^3, R^4 oznaczają niezależnie od siebie atom wodoru lub grupę metylową lub grupę etylową lub grupę hydroksymetylową. Sposób polega na tym, że do reaktora wprowadza się heterogeniczny katalizator, polialkohol oraz keton, dobierając ilości składników tak, by stężenie masowe katalizatora w mieszaninie reakcyjnej mieściło się w zakresie 0,8–10,5 mg/mL. Natomiast stosunek molowy polialkoholu do ketonu był równomolowy lub korzystniej z nadmiarem ketonu, przy czym: jako katalizator stosuje się nośnik z dwutlenku krzemu z naniesioną na nim warstwą aktywną nanocząstek indu, przy czym stężenie nanocząstek indu w masie całego katalizatora wynosi 0,05–4,0% cz. mas., a katalizator ma postać sypkiego proszku albo granulatu, jako polialkohol stosuje się poliol wybrany spośród: glikol propylenowy, glikol etylenowy, gliceryna, jako keton stosuje się 2-butanon albo 3-pentanon albo 1-hydroksyaceton albo 1,3-dihydroksyaceton albo najkorzystniej aceton, następnie reaktor zamyka się. Na kolejnym etapie mieszaninę reakcyjną poddaje się działaniu temperatury o wartości 25–80°C, w czasie 5–150 min, mieszając jednocześnie reagenty z prędkością 150–300 obr./min. Następnie oddziela się katalizator, a z otrzymanej mieszaniny poreakcyjnej, od produktów ubocznych stanowiących pośrednie produkty niedomknięcia pierścienia wydziela się produkty główne, to jest cykliczne ketale, przy czym w wariancie z katalizatorem w postaci sypkiego proszku, po wprowadzeniu składników do reaktora, a przed jego zamknięciem realizuje się proces zawieszenia katalizatora w mieszaninie reakcyjnej. Istotę wynalazku stanowi również katalizator użyty w opisanym sposobie (wg Biul. Urz. Pat. 2025, nr 10, 11).



(I)

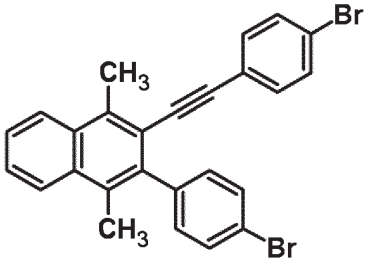
Naturalny czynnik sieciujący i sposób otrzymywania naturalnego czynnika sieciującego – Paulina Sapuła, Katarzyna Bialik-Wąs (Zgłoszenie Nr 446027, Politechnika Krakowska)

Wynalazek dotyczy naturalnego czynnika sieciującego i sposobu jego otrzymywania. Naturalny czynnik sieciujący jest mieszaniną zawierającą kwas chlorogenowy 5-CQA, kwas chlorogenowy 3-CQA, kwas kawowy i kofeinę. Otrzymywany jest z surowca odpadowego po procesie parzenia kawy, który stanowią fusy kawowe, w którym to sposobie 0,1–2,5 g (s.m.) fusów kawowych miesza się z 8,5–10 ml buforu wodnego o pH = 2–12. Następnie dodaje się 0–1,5 ml oleju roślinnego o temperaturze dymienia powyżej 75°C. Na I etapie ekstrakcji, mieszaninę ekstrakcyjną poddaje się działaniu ultradźwięków o mocy 120 W i częstotliwości 40 kHz przez 5–60 min, w stałej temp. 25–70°C. Na II etapie na mieszaninę eks-

trakcyjną działa się mikrofalami o mocy 40–190 W do osiągnięcia temp. 30–75°C. Na III etapie mieszaninę ekstrakcyjną poddaje się działaniu ultradźwięków o parametrach analogicznych jak w I etapie. Otrzymany ekstrakt oddziela się od stałej pozostałości, po czym suszy się do stałej masy, korzystnie liofilizuje (wg Biul. Urz. Pat. 2025, nr 10, 12).

2-(p-bromofenyloetynylo)-3-(p-bromofenylo)-1,4-dimetylonaftalen oraz sposób jego otrzymywania – Stanisław Krompiec, Marek Matussek, Piotr Lodowski, Anna Chrobok, Alina Brzęczek-Szafran, Angelika Mieszczanin (Zgłoszenie Nr 446121, Uniwersytet Śląski w Katowicach; Politechnika Śląska, Gliwice)

Istotę wynalazku stanowi nowa pochodna naftalenu, to jest 2-(p-bromofenyloetynylo)-3-(p-bromofenylo)-1,4-dimetylonaftalen o wzorze (II) oraz sposób jej otrzymywania. Do reaktora wprowadza się 2-metyloacetylooctan etylu, a na 1 mmol tego związku dodaje się: 1–5 mmol 1,4-bis(p-bromofenylo)-1,3-butadiynu, 25–250 mg sit molekularnych, 0,01–0,1 mmol katalizatora, to jest dimeru bromo-tri(karbonyl)-(tetrahydrofuran)renu(I) $[ReBr(CO)_3(THF)]_2$, oraz 1–20 ml niskowrzącego alkilobenzenu. Po zamknięciu reaktora powstałą mieszaninę reakcyjną miesza się i równocześnie ogrzewa się w temp. 120–220°C, przez czas 1–120 godzin. Następnie mieszaninę poreakcyjną ochładza się do temperatury otoczenia, po czym dodaje się 1–5 mmol fluorku cezu, 1–20 ml acetonitrylu oraz 0,5–4 mmol prekursora benzynu, to jest trifluorometanosulfonianu 2-(1-trimetylosililo)fenylu. Całość miesza się w temp. 10–50°C przez czas 1–120 godzin. Na kolejnym etapie z mieszaniny poreakcyjnej odparowuje się lotne frakcje za pomocą próżniowej wyparki rotacyjnej. Ze stałej pozostałości wydziela się surowy produkt za pomocą chromatografii kolumnowej na żelu krzemionkowym stosując jako eluent układ niskowrzący, nasycony węglowodór niskowrzący, chlorowany węglowodór, zmieszane w stosunku objętościowym od 25:1 do 1:25. Finalnie surowy produkt oczyszcza się przeprowadzając ponowny proces chromatografii kolumnowej na żelu krzemionkowym stosując jako eluent układ niskowrzący, nasycony węglowodór niskowrzący, węglowodór aromatyczny, zmieszane w stosunku objętościowym od 25:1 do 1:25. W rezultacie końcowym otrzymuje się 2-(p-bromofenyloetynylo)-3-(p-bromofenylo)-1,4-dimetylonaftalen z wydajnością do 81% i o czystości nie mniejszej niż 98% (wg Biul. Urz. Pat. 2025, nr 11, 12).



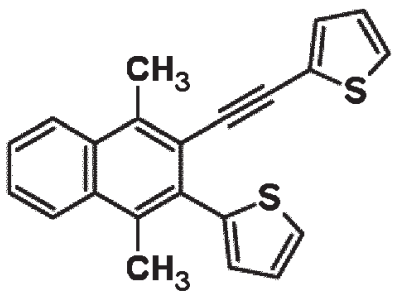
(II)

Sposób utleniania geraniolu w obecności katalizatora – Agnieszka Wróblewska, Sylwia Gajewska, Jadwiga Grzeszczak (Zgłoszenie Nr 446095, Zachodniopomorski Uniwersytet Technologiczny w Szczecinie)

Zgłoszenie dotyczy sposobu utleniania geraniolu w obecności katalizatora, polegający na mieszaniu geraniolu z katalizatorem pod ciśnieniem atmosferycznym, charakteryzuje się tym, że jako katalizator stosuje się proszkowy wermikulit w ilości 0,5–5% mas. względem geraniolu. Mieszaninę reakcyjną (geraniol, wermikulit i tlen) miesza się z intensywnością mieszania 500 obr./min. Utlenianie prowadzi się w obecności tlenu podawanego przez bełkotkę z szybkością przepływu 40 ml/minutę. Utlenianie prowadzi się w temp. 75–100°C, w czasie 15–420 min (wg Biul. Urz. Pat. 2025, nr 11, 15).

2-(2-tienyloetynylo)-3-(2-tienylo)-1,4-dimetylonaftalen oraz sposób jego otrzymywania – Stanisław Krompiec, Marek Matussek, Piotr Lodowski, Anna Chrobok, Alina Brzęczek-Szafran, Angelika Mieszczanin (Zgłoszenie Nr 446124, Uniwersytet Śląski w Katowicach; Politechnika Śląska, Gliwice)

Istotę wynalazku stanowi 2-(2-tienyloetynylo)-3-(2-tienylo)-1,4-dimetylonaftalen o wzorze (III) oraz sposób jego otrzymywania polegający na tym, że do reaktora wprowadza się odpowiedni β-ketoester, to jest 2-metyloacetylooctan etylu, a na 1 mmol tego związku dodaje się: 1–5 mmol 1,4-bis(2-tienylo)-1,3-butadiynu, 25–250 mg sit molekularnych, 0,01–0,1 mmol dimeru bromo-tri(karbonyl)-(tetrahydrofuran)renu(I), oraz 1–20 ml niskowrzącego alkilobenzenu. Po zamknięciu reaktora powstałą mieszaninę reakcyjną miesza się i równocześnie ogrzewa w temp. 120–220°C, przez czas 1–120 godzin. Następnie mieszaninę poreakcyjną ochładza się do temperatury otoczenia, po czym dodaje się – również w przeliczeniu na 1 mmol 2-metyloacetylooctanu etylu – 1–5 mmol fluorku cezu, 1–20 ml acetonitrylu oraz 0,5–2 mmol trifluorometanosulfonianu 2-(1-trimetylosililo)fenylu, a całość miesza się w temp.10–50°C przez czas 1–120 godzin. Na kolejnym etapie z mieszaniny poreakcyjnej odparowuje się lotne frakcje za pomocą próżniowej wyparki rotacyjnej, a ze stałej pozostałości wydziela się surowy produkt za pomocą chromatografii kolumnowej na żelu krzemionkowym stosując jako eluent układ niskowrzący, nasycony węglowodór niskowrzący, chlorowany węglowodór, w proporcjach objętościowych od 20:1 do 1:25. Następnie



(III)

korzystnie surowy produkt oczyszcza się przeprowadzając ponowny proces chromatografii kolumnowej na żelu krzemionkowym stosując jako eluent układ niskowrzący, nasycony węglowodór niskowrzący, węglowodór aromatyczny, w proporcjach objętościowych od 20:1 do 1:25. Finalnie uzyskuje się 2-(2-tienyloetynylo)-3-(2-tienylo)-1,4-dimetylonaftalen z wydajnością do 80% i o czystości nie mniejszej niż 98%. Produkt może być nanomateriałem dla organicznej elektroniki, może też podlegać dalszej ekspansji układu pi-elektronowego. Może też być monomerem do syntezy polimerów przewodzących (wg Biul. Urz. Pat. 2025, nr 11, 16).

Sposób otrzymywania usieciowanych żywic poliestrowych o właściwościach antybakteryjnych – Barbara Gawdzik, Przemysław Pączkowski (Zgłoszenie Nr 450039, Uniwersytet Marii Curie-Skłodowskiej, Lublin)

Przedmiotem zgłoszenia jest sposób otrzymywania usieciowanych żywic poliestrowych, takich jak maleinowo-ftalowe żywice poliestrowe, nienasycone żywice maleinowo-izoftalowe, żywice tereftalowe otrzymywane z recyklatu PET oraz żywic winylowo-estrowych, mający na celu nadanie im właściwości antybakteryjnych, co jest istotne z punktu widzenia ich zastosowania w produkcji przedmiotów codziennego użytku, urządzeń, konstrukcji, kompozytów czy opakowań z tworzyw sztucznych. Wynalazek rozwiązuje problem techniczny w postaci opracowania nowego sposobu otrzymywania usieciowanych żywic o właściwościach antybakteryjnych, bez stosowania toksycznych soli metali ciężkich, głownie nanosrebra. Klatrochelat żelaza (II) użyty w postaci roztworu w polarnym niearomatycznym rozpuszczalniku organicznym dobrze mieszającym się żywicą, w odpowiedniej ilości w stosunku do reagentów, jest skutecznym modyfikatorem żywic poliestrowych nadającym im właściwości antybakteryjne (wg Biul. Urz. Pat. 2025, nr 11, 18).

Sposób katalitycznego hydroodchlorowania węglowodorów ciekłych – Osazuwa Osawaru, Antoni Migdał, Anna Zgudka, Piotr Niewiadomski, Dominika Kubica, Małgorzata Walkiewicz, Dominik Mierzwa, Michał Odrowąż-Sypniewski (Zgłoszenie Nr 446254, Sieć Badawcza Łukasiewicz - Instytut Chemii Przemysłowej imienia Profesora Ignacego Mościckiego, Warszawa)

Wynalazek dotyczy sposobu katalitycznego hydroodchlorowania węglowodorów ciekłych zawierających chlorki, prowadzony w układzie przepływowym wobec stałego katalizatora, polegający na tym, że na pierwszym etapie katalizator wybrany z grupy obejmującej Fe, FeO, Fe_2O_3, Fe_3O_4, MnO, MgO, CaO, BaO lub $Ba(OH)_2$ lub ich mieszaninę, kontaktuje się z gazowym wodorem. Następnie wprowadza się zasilający ciekły strumień węglowodorowy zawierający chlorki/chlor i prowadzi się hydroodchlorowanie w temp. 100–400°C, pod ciśnieniem od atmosferycznego do 5 bar. (wg Biul. Urz. Pat. 2025, nr 13, 13).

Kompozycja elastomerowa o podwyższonej odporności na utlenianie oraz fotostarzenie – Anna Masek, Małgorzata Latos-Brózio, Natalia Tomicka, Radosław Busiak (Zgłoszenie Nr 446306, Politechnika Łódzka)

Kompozycja elastomerowa przeznaczona na wyroby polimerowe o podwyższonej odporności na utlenianie oraz fotostarzenie, zawierająca kopolimer etylenowo-norbornenowego oraz naturalny przeciwutleniacz w postaci opadłych liści klonu pospolitego, zmielonych na proszek i wysuszonych, w ilości 10–30 cz. mas. na 100 cz. mas. kopolimeru lub opadłe liście klonu pospolitego, zmielone na proszek, następnie zmodyfikowane bezwodnikiem maleinowym lub 3-metakryloksypropylotrimetoksysilanem i wysuszone, w ilości 10 cz. mas. na 100 cz. mas. kopolimeru (wg Biul. Urz. Pat. 2025, nr 14, 8).

Sposób prowadzenia hydropirolizy ciekłych surowców zawierających frakcje węglowodorowe pochodzące z rozkładu polimerów – Dymitr Czechowicz, Adam Andrzej Marek (Zgłoszenie Nr 446300, Politechnika Śląska, Gliwice)

Przedmiotem zgłoszenia jest sposób prowadzenia hydropirolizy ciekłych surowców zawierających frakcje węglowodorowe pochodzące z rozkładu polimerów, który cechuje się tym, że hydropirolizie poddaje się surowiec stanowiący ciekłą frakcją węglowodorową pochodzącą z destylacji ropy naftowej z roztworzonym w niej woskiem pochodzącym z termicznego rozkładu polietylenu, przy czym udział wosku pochodzącego z termicznego rozkładu polietylenu w surowcu wynosi 10–30% mas. Ciekłą frakcją węglowodorową pochodzącą z destylacji ropy naftowej jest benzyna lekka, benzyna ciężka, nafta lub olej napędowy, korzystnie benzyna ciężka (wg Biul. Urz. Pat. 2025, nr 14, 8).

Sposób otrzymywania folii z recyklingowanego poli(tereftalanu etylenu) metodą prasowania oraz matryca do wielokrotnego wytłaczania folii – Maciej Kapkowski, Sonia Kotowicz, Mateusz Korzec (Zgłoszenie Nr 445972, Uniwersytet Śląski w Katowicach)

Zgłoszenia dotyczy sposobu otrzymywania folii z recyklingowanego poli(tereftalanu etylenu) (rPET) metodą prasowania, polegający na tym, że proces przeprowadza się w matrycy do wielokrotnego wytłaczania foli złożonej z wieczka w postaci płytki i obudowy matrycy o jednakowej grubości oraz z teflonowej formy, gdzie obudowa jest płytką z wewnętrznym otworem dopasowanym kształtem i rozmiarem do wieczka, gdzie wieczko powleczone jest materiałem teflonowym odpornym na działanie temp. 260–300°C. Forma z materiału teflonowego jest w kształcie płytki o wymiarach wewnętrznego otworu obudowy matrycy z czterema zewnętrznymi skrzydłami o zasadniczo trapezoidowym kształcie. Formę umieszcza się w obudowie matrycy, gdzie w formie równomiernie rozprowadza się proszek zawierający co najmniej jeden polimer lub mieszaninę co najmniej jednego polimeru z co najmniej jednym barwnikiem w ilości minimum

32–85 mg na 1 cm^2, nakrywa wieczkiem. Następnie zamyka się skrzydła, tak przygotowaną matrycę przenosi na rozgrzaną płytę grzewczą do temp. 260–280°C (korzystnie 280°C) i dociska się równomiernie przez 5–10 min (minimum 5 min, korzystnie 10 min), po czym gorącą matrycę, przenosi się na zimną powierzchnię o wymiarach nie mniejszych niż wieczko i dociska się równomiernie płytą roboczą prasy z naciskiem 280–300 g/cm^2, korzystnie w temperaturze pokojowej przez 3–5 min (korzystnie 5 min), po czym otrzymaną folię polimerową wyciąga się z formy z materiału teflonowego (wg Biul. Urz. Pat. 2025, nr 15, 9).

Zastosowanie pigmentów organiczno-nieorganicznych do barwienia kompozycji polimerowych – Anna Marzec, Małgorzata Kuśmierek, Bolesław Szadkowski (Zgłoszenie Nr 446404, Politechnika Łódzka)

Wynalazek dotyczy zastosowania pigmentów organiczno-nieorganicznych do barwienia kompozycji polimerowej kauczuku butadienowo-akrylonitrylowego i kompozycji polimerowej kopolimeru etylenowo-norbornenowego, polegający na tym, że stosuje się pigmenty organiczno-nieorganiczne otrzymane znanym sposobem w reakcji barwników azowych w formie chlorków kwasowych z nieorganicznym nośnikiem sfunkcjonalizowanym związkiem krzemoorganicznym zawierającym w swojej strukturze 1, 2 lub 3 grupy aminowe (wg Biul. Urz. Pat. 2024, nr 16, 14).

Sposób wytwarzania wodoru z gazu ziemnego – Jarosław Milewski (Zgłoszenie Nr 449570, Politechnika Warszawska)

Przedmiotem zgłoszenia jest sposób wytwarzania wodoru z gazu ziemnego w procesie reformingu, obejmujący połączone etapy: reformingu parowego metanu (CH_4) z gazu ziemnego w wodór (H_2) i dwutlenek węgla (CO_2) poprzez reakcję z parą wodną w obecności katalizatora, separacji CO_2 od mieszaniny gazowej H_2 i CO_2, sprężenia odseparowanego CO_2 i wtłoczenia sprężonego CO_2 do złoża gazu ziemnego (wg Biul. Urz. Pat. 2024, nr 16, 14).

Sposób otrzymywania pigmentów hybrydowych oraz ich zastosowanie – Anna Marzec, Małgorzata Kuśmierek, Bolesław Szadkowski (Zgłoszenie Nr 446442, Politechnika Łódzka)

Zgłoszenie dotyczy sposobu otrzymywania pigmentów hybrydowych, polegający na tym, że sporządza się roztwór chinizaryny w mieszaninie wody i roztworu wodnego wodorotlenku sodowego o stężeniu 30%, po czym sporządzony roztwór poddaje się reakcji z podsiarczynem sodowym w temp. 50°C w trakcie intensywnego mieszania. Następnie dodaje się 15% roztworu wodnego kwasu solnego do uzyskania pH kwaśnego wskazanego przy użyciu papierka Kongo i po odsączeniu pod zmniejszonym ciśnieniem powstałego osadu leukochinizaryny, płucze się go wodą destylowaną, etanolem i po odsączeniu suszy w temp. 100°C w czasie 1 h. Otrzymany w ten sposób barwnik – leukochinizarynę poddaje się reakcji z silanem w temperaturze pokojowej w czasie 5 min, w trakcie intensywnego mieszania, a otrzymany produkt poddaje się dalej reakcji z nośnikiem w środowisku toluenu w czasie 24 h w temperaturze pokojowej przy intensywnym mieszaniu. Otrzymany w ten sposób pigment hybrydowy, po przesączeniu pod zmniejszonym ciśnieniem, przemywa się kilkakrotnie toluenem i etanolem i suszy w temp. 80°C w ciągu 24 h. Zgłoszenie obejmuje także zastosowanie pigmentów hybrydowych otrzymanych powyższym sposobem. Otrzymane pigmenty hybrydowe stosuje się do barwienia kompozycji polimerowej kauczuku butadienowo-akrylonitrylowego i kompozycji polimerowej kopolimeru etylenowo-norbornenowego (wg Biul. Urz. Pat. 2024, nr 16, 15).

Elektrochemiczny sposób odzysku metali z krzemowych ogniw fotowoltaicznych – Jakub Lach, Kamil Wróbel, Dorota Kolasa, Wojciech Tokarz (Zgłoszenie Nr 446425, Sieć Badawcza Łukasiewicz – Instytut Chemii Przemysłowej imienia Profesora Ignacego Mościckiego, Warszawa)

Istotę wynalazku stanowi elektrochemiczny sposób odzysku metali, w szczególności jednoczesnego odzysku srebra, miedzi i ołowiu z krzemowych ogniw fotowoltaicznych, poddanych uprzednio wstępnej obróbce mechanicznej i termicznej, następnie ługowaniu roztworem kwasu azotowego(V) i odfiltrowaniu frakcji stałych. Otrzymany roztwór z ługowania ogniw fotowoltaicznych poddaje się elektrolizie w układzie dwuelektrodowym, przy czym: na I etapie elektrolizę prowadzi się przy napięciu o wartości 0,5–1,6 V, do momentu zakończenia powstawania osadu katodowego. Następnie na II etapie elektrolizę prowadzi się przy napięciu o wartości 1,8–2,5 V, do momentu zakończenia powstawania osadu katodowego i anodowego, stosując jako katodę, jak i anodę, elektrodę platynową, elektrodę tytanową pokrytą warstwą platyny lub elektrodę tytanową pokrytą warstwą mieszaniny tlenków metali szlachetnych (wg Biul. Urz. Pat. 2024, nr 16, 16).

mgr inż. Małgorzata Choroś

NEW BOOKS

NANOPAINTS
Characterization, Formulation, and Emerging Applications
Editors: Bhasha Sharma, Vijay Chaudhary, Prakash Chander Thapliyal, Vijay Mannari (Elsevier)
1st edition, 2025, 560 pages, 206.54 EUR
ISBN 9780443265129
ISBN 9780443265136 (e-Book)
The book provides a comprehensive overview of the state-of-the-art and recent advancements in the development and applications of natural nanopaints. It delves into the classification and formulation of paints using natural resources and discusses their characterization techniques. The subsequent chapters shed light on the challenges posed by the environmental and economic feasibility analysis of nano-enabled paints, highlighting the opportunities they present as well as the obstacles they face. This publication is an important resource for researchers and professionals seeking to explore the use of green nanoparticles in the development of nanopaints, offering valuable insights into how these nanopaints can surpass the durability and performance of traditional paints.

ADDITIVE MANUFACTURING OF FUNCTIONAL POLYMERS AND NANOCOMPOSITES
Recent Progress, Applications, Challenges and Future Opportunities
Editors: Chaudhery Mustansar Hussain, Kalim Deshmukh (Elsevier)
1st edition, 2025, 216.74 EUR
ISBN 9780443265167
ISBN 9780443265174 (e-Book)
Authors and editors of this publication provide up-to-date knowledge in this important research field. The book provides a comprehensive overview of the whole development phase, from material synthesis to component design and manufacturing and applications. The contents are divided into five key parts. Section 1 introduces additive manufacturing of functional polymers and nanocomposites and discusses the numerous developments and perspectives that have been perceived over recent years. Section 2 looks at the various types of functional polymers and nanocomposite materials, including their characterization, and the various synthesis techniques that can be employed to fabricate customized objects using AM technologies. Section 3 focuses on the use of functional polymers and nanocomposites in a broad range of applications including health care, electronics, automotive, robotics, aerospace, and other industrial sectors. Section 4 focuses on theoretical modeling and machine learning approaches. Section 5 discusses key challenges, the environmental and health impact, commercialization aspects and opportunities for the future. This book will be an excellent source of information for academic and industrial researchers, materials scientists and engineers, chemists, and mechanical engineers and all those working in the field of additive manufacturing of functional polymers and nanocomposite materials.

MAGNETOELECTRIC COMPOSITES
Materials, Structures, and Applications
Editors: Gopalan Srinivasan, Shashank Priya, Nian Sun (Elsevier)
2nd edition, 2025, 564 pages, 195.50 EUR
ISBN 9780443186066
ISBN 9780443186073 (e-Book)
Second edition of this book summarizes the theory behind magnetoelectric phenomena and then introduces magnetoelectric materials and structures and the techniques used to fabricate and characterize them. Part two of the book looks at magnetoelectric devices: applications covered include magnetoelectric sensors, magnetoelectric antennas, transducers for energy harvesting, microwave and millimetre wave devices, and miniature magnetoelectric systems for biomedical applications. The final chapter discusses progress toward magnetoelectric memory. This new edition starts with the phenomena and theory of magnetoelectric materials in bulk laminates, thin-film heterostructures, and nanocomposites. On the magnetoelectric devices side, the contents have been significantly expanded to include energy harvesting, sensing, and magnetoelectric antennas. This book is suitable for materials scientists and engineers working on magnetoelectrics in academia and R&D.

ADVANCED COMPOSITE MATERIALS FOR WASTEWATER TREATMENT
Editors: Norzita Ngadi, R.A. Ilyas, Nur Hafizah Ab Hamid, S.M. Sapuan (Elsevier)
1st edition, 2025, 364 pages, 177.64 EUR
ISBN 9780443336355
ISBN 9780443336362 (e-Book)
Editors of this publication present the latest technological advancements in this important research field. This book explores recent advances in manufacturing, fabrication, and the introduction of functional groups such as tailored layered double hydroxide (LDH)-based nanocomposites and three-dimensional hierarchical nanostructures. Among several discussed composites are those that show maximum efficiency, including graphene composites, bio-based composites (alginate, natural fiber, rubber, etc.); biochar; metal-organic frameworks; geopolymers; nanocomposites; and LDH. This book is an essential reference

resource for researchers, scientists, and industrial professionals as well as postgraduate students providing them with an in-depth understanding of cutting-edge developments in this field. It provides readers with an overview of the evolution of composites in water and wastewater treatment applications.

EMERGING MATERIALS FOR PHOTODEGRADATION AND ENVIRONMENTAL REMEDIATION OF MICRO- AND NANO-PLASTICS

Recent Developments and Future Prospects

Editors: Laxman Singh, Sunil Kumar (Wiley)

1st edition, 2025, 416 pages, 159.00 EUR

ISBN 9781836690092

ISBN 9781394361885 (e-Book)

The book provides an in-depth understanding of the materials, design choices and applications needed for the mitigation of micro- and nano-plastic pollutants from environmental wastewater. This is a topic that continually attracts attention worldwide. This is an important book for academic institutes and libraries, scientific organizations, and global research industries, and has been created for a wide audience. The book provides the scope of material design, synthesis, detailed mechanisms, spectroscopic analysis, and problem-solving strategies in environmental remediation. The scope of the book on reactive, functional materials and applications extends far beyond the emerging technologies that possess valuable insights of the synthesis, processing and physiochemical characteristics and their functional properties for academics, postgraduates, research scholars, scientists, technologists, environmental chemists and industrialists. This book presents fifteen chapters, which explore new ideas in processing, designing, synthesis, selection, application, photocatalytic efficiency and economic justifications of emerging materials.

DEGRADATION, STABILIZATION, AND RECYCLING OF PACKAGING MATERIALS

Muhammad Rabnawaz, Susan E. M. Selke, Ian Wyman (Wiley)

1st edition, 2025, 384 pages, 124.99 EUR

ISBN 9781394294268

ISBN 9781394294275 (e-Book)

The authors of this book analyze packaging materials and their interactions with different environments, discussing the degradation processes of different materials like plastics, wood, paper, glass, and metal, providing specific strategies to deal with these degradation processes, and exploring solid waste management, recent developments in recycling, and the principles of eco-friendly packaging design. Organized into two parts, the first section of this book provides a comprehensive examination of how environmental factors such as heat, shear, light, air, packaged products, and stress affect packaging materials, focusing on the chemistry of their deterioration and stabilization methods. The second section explores solid waste management, recent developments in recycling, and key principles of eco-friendly packaging design, culminating in an extensive discussion of legal and regulatory aspects. The book includes case studies and problem sets in each chapter, with solutions to the problems in an appendix in the back of the book. Presenting advanced technical knowledge that demystifies the sustainable packaging landscape this publication is a critical resource for researchers, students, and industry professionals in the field of materials science and packaging to evaluate challenges related to solid waste and devise effective disposal strategies.

SMART TEXTILES AND WEARABLES FOR HEALTH AND FITNESS

Editors: Jyotirmoy Pathak, Abhishek Kumar, Suman Lata Tripathi, Balwinder Raj (Wiley)

1st edition, 2025, 464 pages, 188.99 EUR

ISBN 9781394302949

ISBN 9781394302871 (e-Book)

The book provides an in-depth exploration of how innovative technologies and materials are reshaping healthcare, making it an essential resource for anyone who wants to understand the transformative power of smart textiles and wearables in patient monitoring, diagnosis, and rehabilitation. Authors explores the transformative influence of flexible electronics on the healthcare field. The book's chapters include a broad spectrum of topics, each offering valuable perspectives on the intersection of textiles, wearables, and health technology. Readers can delve into the unique technologies and materials driving the flexible electronics revolution, offering insights into their development and applications. The study explores the diverse uses of intelligent textiles and wearable devices in healthcare, encompassing activities such as monitoring patients, diagnosing conditions, aiding rehabilitation, and administering therapeutic interventions. In this volume, we will explore the incorporation of sensors, biometrics, and biomarkers into textiles to present their ability for immediate health monitoring and data collection. Additionally, the readers will explore the possible uses of smart textiles and wearables in coping with chronic illnesses, tracking sports and fitness activities, and facilitating human-computer interaction in medical settings. This book promises an engaging journey through the frontiers of technology, offering a comprehensive understanding of the transformative potential of smart textiles and wearables in revolutionizing healthcare and improving patient treatment outcomes.

NANOTECHNOLOGY-ASSISTED RECYCLING OF TEXTILE WASTE: SUSTAINABLE TOOLS FOR TEXTILES

Editors: Prashansa Sharma, Shilpi Shree Sahay (Wiley)

1st edition, 2025, 528 pages, 173.99 EUR

ISBN 9781394174492

ISBN 9781394174997 (e-Book)

This book investigates nanotechnology-assisted sustainable solutions and their potential to transform waste into opportunity by fostering innovative designs and in-depth knowledge of sustainable waste management and nanotechnology applications. Divided into four comprehensive parts, comprising 16 chapters, editors and authors provide insights into the potential of nanotechnology in revolutionizing textile recycling and shaping the future of sustainable textiles. Part I presents an insightful overview of textile waste and management, exploring the conceptual dimensions and challenges in handling and organizing textile waste. It also describes the innovative realm of textile recycling. Part II focuses on comprehensive, sustainable, and productive recycling of waste using nanotechnology. Here, readers are invited to explore the transformative contributions of nanotechnology in shaping sustainable textile design and characterizing functional properties of novel recycled nanotextiles. Future perspectives of nanotechnology in textile applications, particularly concerning waste recycling, are also examined. Part III explores deeper into the advanced application of recycled and nano-assisted novel textiles generated through waste. From sports textiles to technical textiles, this section explores the diverse applications of recycled waste, enhanced by nano-engineered innovations. Finally, Part IV addresses the critical aspects of quality control and regulatory compliance in the realm of advanced nano-textile materials through an exploration of global legislation, schemes, and standards. The book will be read by a range of researchers, engineers and students in technical textiles, textile technology and engineering, textile chemistry, fiber science, textile processing technologies and manufacturing, fashion and textile technology, materials science and environmental science. This book will help designers and clothing manufacturers, and all those in textile and environmental domains, who are engaged in waste management.

MOLECULAR NANOGRAPHENES
Synthesis, Properties, and Applications
Editors: Nazario Martin, Colin P. Nuckolls (Wiley)
1st edition, 2025, 544 pages, 133.99 EUR
ISBN 9783527353224
ISBN 9783527845002 (e-Book)

Graphene, comprised of a single layer of carbon atoms in a honeycomb nanostructural arrangement, is the thinnest and strongest material yet known to science. Despite that this pristine carbon allotrope exhibits a variety of outstanding properties, its zero bandgap prevents its use for some optoelectronic applications. Fragments of graphene, or nanographenes, have shown a great potential to prevent these problems, thus paving the way for the development of chiroptical and optoelectronic properties. This book can be considered as a comprehensive overview on the synthesis of these materials and their properties. Covering their widely varying morphologies, their potential applications, and their valuable chiroptical and photophysical features, it also analyzes multiple approaches to obtain nanographene by using both top-down and bottom-up methodologies. The result is a one-stop shop for materials scientists and other researchers interested in these emergent and fascinating materials. This publication is ideal for materials scientists, polymer chemists, solid state chemists, organic chemists, and any other researchers looking to work with shape and size-controlled flakes of graphenes.

M. Sc. Mateusz Borkowski

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Chemical formulas and equations shall be marked with consecutive Latin letters (*e.g.* Scheme A). They shall be written with ChemWin program, Palatino Linotype font, 9 pt, in sub/superscripts 7 pt, bonds 2 mm long).

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[1] Gaina C., Gaina V., Sara M. *et al.*: *Journal of Macromolecular Science, Part A. Pure and Applied Chemistry* **1996**, *33(11)*, 1755.

https://doi.org/10.1080/10601329608010939

[2] Krijgsman J., Feijen J., Gaymans R. J.: *Polymer* **2004**, *45(13)*, 4677.

https://doi.org/10.1016/j.polymer.2004.04.038

[3] Nam Ch.K., Yong T.K., Sung W.N. *et al.*: *Polymer Bulletin* **2013**, *70*, 23.

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[1] Lenz R: "Organic chemistry of synthetic high polymers", Interscience Publishers, John Wiley and Sons, New York, London, Sydney 1967, p. 742.

A patent or patent application

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[1] *Pat. Jap.* 1 135 663 (1989).

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