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PACKAGING SCIENCE

*E' la Rassegna Scientifica Internazionale della **Fondazione Carta Etica del Packaging**.*

Pubblicazione bimestrale in cui sono presentati 7 articoli multidisciplinari, afferenti al packaging, selezionati da diverse riviste del mondo scientifico digitale.

*Packaging Science attraverso le tematiche sempre attuali ed aggiornate dei suoi articoli in diverse discipline, concorre ampiamente alla promozione e all'evoluzione della corretta cultura del packaging e dei **10 Valori della Carta Etica** per accompagnare il packaging verso un futuro più consapevole.*

Notifiche gravi sui materiali a contatto con gli alimenti nell'UE RASFF

Per la prima volta nel periodo 2012-2019 sono state analizzate le notifiche di allerta grave e di rifiuto alle frontiere sui materiali a contatto con gli alimenti (FCM) recuperate dal database RASFF. I risultati indicano che la Cina è stato il principale paese trasgressore per entrambi i tipi di notifiche. Sono state osservate differenze nelle quote percentuali degli intervalli di fase di ritardo tra i primi quattro paesi notificanti, indicando una mancanza di armonizzazione nella segnalazione tempestiva di notifiche di allerta grave e respingimento delle frontiere per FCM. La migrazione delle ammine aromatiche primarie e dei metalli sono stati complessivamente i pericoli più frequentemente segnalati nel periodo di analisi.



Article

Serious Notifications on Food Contact Materials in the EU RASFF

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Abstract: Serious alert and border rejection notifications on food contact materials (FCM) retrieved from the RASFF database were analyzed for the first time regarding the period 2012–2019. The findings indicate that China was the main transgressor country for both types of notifications. Official controls were responsible for most FCM serious alerts (91.78%), and border rejection (90.82%) notifications. Another novelty proposed herein, is the criterion for “lag phases” (time from sampling to notification dates). Overall percentage distributions of lag phases, for all RASFF Member States, for the intervals of 0–50 days and 51–≥101 days, were 25.09% and 67.87% for serious alert notifications and 65.21% and 29.34% for serious border rejection notifications. Differences in percent shares of lag phase intervals were observed between the top-four notifying countries, indicating a lack of harmonization in timely reporting of serious alert and border rejection notifications for FCM. Migration of primary aromatic amines and of metals were the most frequently notified hazards overall in the period of analysis. A decreasing trend is observed in the two more recent biannual averages of serious alert notifications for primary aromatic amines and metals, while decreasing for metals but increasing for primary aromatic amines in serious border rejection notifications.



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Serious Notifications on Food Contact
Materials in the EU RASFF. *Vet. Sci.*

Keywords: RASFF; serious; alert; border rejection; food contact materials; HFAA/ex-FVO; BTSF; EFSA; Codex Alimentarius Commission

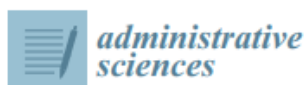
Vet. Sci. **2021**, *8*, 56. <https://doi.org/10.3390/vetsci8040056>

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Il Green Deal, piani nazionali per l'energia e il clima in Europa: conformità e strategie degli Stati membri

Questo documento analizza le politiche dell'UE per l'energia e il clima, utilizzando il quadro teorico di Börzel sull'europeizzazione, ed esamina le risposte, le strategie e la conformità del Green Deal degli Stati membri. Come espresso nei National Energy and Climate Plans (NECPs). Lo scopo principale e il principale contributo di questo studio è quello di condurre una ricerca aggiornata sulla progettazione e l'adozione delle politiche degli Stati membri dell'UE su questioni di politica europea comune e di integrazione. Uno di questi riguarda la questione della politica energetica e climatica, ma anche il Green Agreement in generale, che è stato recentemente annunciato e che si prevede avrà il maggiore impatto sulla politica europea nel prossimo periodo 2021-2027.



Article

The Green Deal, National Energy and Climate Plans in Europe: Member States' Compliance and Strategies

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Abstract: This paper analyses the EU's policies for energy and climate, using Börzel's theoretical framework on Europeanisation, and examines Member States' Green Deal responses, strategies, and compliance. As expressed in their final NECPs, although Member States' responses vary, most of the critical components were partially addressed, while the others were largely addressed. We observe a considerable variation in Member States' strategies. Member States classified as foot-dragging beforehand are fence-sitting now, while those previously categorised as fence-sitting are now either foot-dragging or pace-setting. The root cause of these classification changes for the Member States within the EU can be traced back to their internal environments in which the involved stakeholders each have a different response pace regarding environment, climate, and energy. We present and analyse our theoretical context, discuss the EU's energy policies and the NECPs, examine Member States' responses and compliance with this new framework, and propose several challenges.

Keywords: European Union; energy; environment; compliance; Green Deal; NECP; strategy



Associazioni tra esposizioni a sostanze perfluoroalchiliche e diabete, iperglicemia o insulino-resistenza: una revisione della tematica.

Le sostanze per- e polifluoroalchiliche (PFAS) sono inquinanti ambientali persistenti che si trovano comunemente nel corpo umano a causa di esposizioni tramite acqua potabile, tensioattivi utilizzati nei materiali di consumo e schiume acquose filmogene (AFFF). L'esposizione a PFAS è stata collegata a effetti avversi sulla salute come basso peso alla nascita, cancro e disturbi endocrini, sebbene sempre più studi abbiano dimostrato che possono perturbare i processi metabolici e contribuire alla disfunzione. Questa revisione mirata riassume la chimica dell'esposizione a PFAS e le prove epidemiologiche per le associazioni tra l'esposizione a sostanze per- e polifluoroalchiliche e lo sviluppo di diabete, iperglicemia e/o resistenza all'insulina.



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Systematic Review

Associations between Exposures to Perfluoroalkyl Substances and Diabetes, Hyperglycemia, or Insulin Resistance: A Scoping Review

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Abstract: Per- and polyfluoroalkyl substances (PFASs) are persistent environmental pollutants that are commonly found in the human body due to exposures via drinking water, surfactants used in consumer materials, and aqueous film-forming foams (AFFFs). PFAS exposure has been linked to adverse health effects such as low infant birth weights, cancer, and endocrine disruption, though increasingly studies have demonstrated that they may perturb metabolic processes and contribute to dysfunction. This scoping review summarizes the chemistry of PFAS exposure and the epidemiologic evidence for associations between exposure to per- and polyfluoroalkyl substances and the development of diabetes, hyperglycemia, and/or insulin resistance. We identified 11 studies on gestational diabetes mellitus, 3 studies on type 1 diabetes, 7 studies on type 2 diabetes, 6 studies on prediabetes or unspecified diabetes, and 15 studies on insulin resistance or glucose tolerance using the SCOPUS and PubMed databases. Approximately 24 reported positive associations, 9 negative associations, 2 non-linear associations, and 2 inverse associations, and 8 reported no associations found between PFAS and all diabetes search terms. Cumulatively, these data indicate the need for further studies to better assess these associations between PFAS exposure and diabetes.

Keywords: perfluoroalkyl substances; PFAS; diabetes; hyperglycemia; insulin resistance

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Approfondimenti sui fotocatalizzatori di biossido di titanio biodegradabili supportati da polimeri per il risanamento ambientale.

Tenendo conto dei numerosi substrati testati per supportare i fotocatalizzatori TiO_2 , l'uso del polimero biodegradabile sembra un'opzione promettente a causa dei suoi notevoli meriti, tra cui la natura flessibile, il basso prezzo, l'inerzia chimica, la stabilità meccanica e l'ampia fattibilità. La presente revisione pone l'accento su articoli di ricerca pubblicati di recente (2011–2021) ed espone gli studi più innovativi che facilitano i polimeri biodegradabili eco-compatibili per fabbricare fotocatalizzatori a base di polimeri, mentre vengono discussi anche i dettagli di preparazione, le prestazioni fotocatalitiche e il riutilizzo dei fotocatalizzatori TiO_2 /polimero. I polimeri biodegradabili qui esaminati comprendono chitosano (CS), cellulosa, alginato, amido, poli(acido lattidico) (PLA), policaprolattone (PCL) e poli(lattide-co-glicilide) (PLGA), mentre viene fornita un'enfasi sulla via sintetica (dip-coating, elettrofilatura, ecc.) dei fotocatalizzatori.



macromol



Review

Insights into Biodegradable Polymer-Supported Titanium Dioxide Photocatalysts for Environmental Remediation

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Citation: Ainali, N.M.; Kalaronis, D.; Evgenidou, E.; Bikiaris, D.N.; Lambropoulou, D.A. Insights into Biodegradable Polymer-Supported Titanium Dioxide Photocatalysts for

Abstract: During the past two decades, immobilization of titanium dioxide (TiO_2), a well-known photocatalyst, on several polymeric substrates has extensively gained ground since it limits the need of post-treatment separation stages. Taking into account the numerous substrates tested for supporting TiO_2 photocatalysts, the use of biodegradable polymer seems a hopeful option owing to its considerable merits, including the flexible nature, low price, chemical inertness, mechanical stability and wide feasibility. The present review places its emphasis on recently published research articles (2011–2021) and exhibits the most innovative studies facilitating the eco-friendly biodegradable polymers to fabricate polymer-based photocatalysts, while the preparation details, photocatalytic performance and reuse of the TiO_2 /polymer photocatalysts is also debated. The biodegradable polymers examined herein comprise of chitosan (CS), cellulose, alginate, starch, poly(lactid acid) (PLA), polycaprolactone (PCL) and poly(lactide-co-glycolide) (PLGA), while an emphasis on the synthetical pathway (dip-coating, electrospinning, etc.) of the photocatalysts is provided.

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<https://www.mdpi.com/journal/macromol>

<https://www.mdpi.com/2673-6209/1/3/15>

Informare il pubblico ed educare gli studenti sul riciclo della plastica.

Ogni anno vengono generati circa 300 milioni di tonnellate di rifiuti di plastica. La maggior parte di questi rifiuti di plastica viene messa in discarica, mentre una parte di essa fuoriesce nell'ambiente. Quando i rifiuti di plastica entrano nell'ambiente terrestre o acquoso, possono avere impatti negativi sugli ecosistemi, sulla salute umana e sulla fauna selvatica. Aumentare la quantità di rifiuti di plastica riciclati ridurrà di conseguenza la quantità di rifiuti di plastica che entrano nell'ambiente. Educando il pubblico e l'industria sul riciclo della plastica, gli attuali programmi di riciclo possono essere utilizzati in modo più efficiente e possono essere creati nuovi programmi. Il materiale didattico sul riciclo della plastica è disponibile attraverso associazioni professionali e di settore, fondazioni con un focus ambientale, corsi universitari e corsi brevi offerti con aziende private.



Review

Informing the Public and Educating Students on Plastic Recycling

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Abstract: Approximately 300 million tons of plastic waste is generated per year. The major portion of this plastic waste is landfilled, while part of it leaks into the environment. When plastic waste enters the terrestrial or aqueous environment, it can have negative impacts on ecosystems, human health, and wildlife. Increasing the amount of plastic waste that is recycled will correspondingly reduce the amount of plastic waste that enters the environment. By educating the public and industry on plastic recycling, current recycling programs can be used more efficiently, and new programs can be created. Education material on plastic recycling is available through professional and industry associations, foundations with an environmental focus, university courses, and short courses offered with private companies. This review assembles and analyzes the current education material on plastic recycling that is available from these providers. The material compiled here can be used to gain insight into specific plastic recycling-related topics, to identify areas of recycling education that can be improved, and as a resource to help build university level courses. There is currently a dearth of plastic recycling courses offered at the university level. Educating more students on plastic recycling will equip them with the knowledge and skills to make informed decisions as consumers, and to implement plastic recycling systems at the professional level.



Citation: Bennett, E.M.; Alexandridis, P. Informing the Public and Educating Students on Plastic Recycling. *Recycling* **2021**, *6*, 69.

Keywords: recycling; education; waste management; circular economy; sustainability

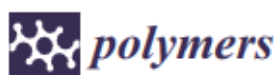
Recycling **2021**, *6*, 69. <https://doi.org/10.3390/recycling6040069>

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Valutazione della tossicità e della biodegradabilità dei materiali a base di PVA nell'acqua marina

A causa del continuo aumento della produzione di plastica convenzionale e della gestione carente dei rifiuti di plastica, l'industria sta sviluppando prodotti di plastica alternativi realizzati con polimeri biodegradabili o biobased. La sfida al giorno d'oggi è quella di creare un nuovo prodotto che combini i vantaggi delle plastiche convenzionali con proprietà rispettose dell'ambiente. Questo studio si concentra sulla valutazione del potenziale impatto che i polimeri a base di alcol polivinilico (PVA) possono avere una volta rilasciati nell'ambiente marino, in termini di biodegradazione in acqua di mare (valutata dalla percentuale della domanda teorica di ossigeno, o % ThOD, di ciascun composto) e tossicità acquatica, secondo il test di tossicità standard utilizzando larve di *Paracentrotus lividus*.



Article

Assessment of Toxicity and Biodegradability of Poly(vinyl alcohol)-Based Materials in Marine Water

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Abstract: Due to the continuous rise in conventional plastic production and the deficient management of plastic waste, industry is developing alternative plastic products made of biodegradable or biobased polymers. The challenge nowadays is to create a new product that combines the advantages of conventional plastics with environmentally friendly properties. This study focuses on the assessment of the potential impact that polyvinyl alcohol (PVA)-based polymers may have once they are released into the marine environment, in terms of biodegradation in seawater (assessed by the percentage of the Theoretical Oxygen Demand, or % ThOD, of each compound) and aquatic toxicity, according to the standard toxicity test using *Paracentrotus lividus* larvae. We have tested three different materials: two glycerol-containing PVA based ones, and another made from pure PVA. Biodegradation of PVA under marine conditions without an acclimated inoculum seems to be negligible, and it slightly improves when the polymer is combined with glycerol, with a 5.3 and 8.4% ThOD achieved after a period of 28 days. Toxicity of pure PVA was also negligible (<1 toxic units, TU), but slightly increases when the material included glycerol (2.2 and 2.3 TU). These results may contribute to a better assessment of the behavior of PVA-based polymers in marine environments. Given the low biodegradation rates obtained for the tested compounds, PVA polymers still require further study in order to develop materials that are truly degradable in real marine scenarios.

Keywords: poly(vinyl alcohol); glycerol; microplastics; biodegradation; toxicity; marine water

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Materiali a contatto con gli alimenti: migrazione e analisi. Sfide e limitazioni sull'identificazione e la quantificazione

I materiali a contatto con gli alimenti (FCM) sono definiti come gli oggetti e i materiali destinati a entrare in contatto diretto o indiretto con gli alimenti, mentre gli articoli a contatto con gli alimenti sono definiti come oggetti, ovvero attrezzature, contenitori, imballaggi e utensili vari che sono chiaramente destinati ad essere utilizzati per la fabbricazione, la preparazione, la conservazione, il flusso, il trasporto o la manipolazione dei prodotti alimentari. I materiali plastici sono ampiamente utilizzati nelle applicazioni di imballaggio alimentare; tuttavia, vi è una crescente preoccupazione a causa del possibile rilascio di componenti indesiderabili negli alimenti. Tra le sfide essenziali per l'identificazione le strategie analitiche armonizzate.



Editorial

Food Contact Materials: Migration and Analysis. Challenges and Limitations on Identification and Quantification

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Food contact materials (FCM) are defined as the objects and materials intended to come into direct or indirect contact with foodstuff, while food contact articles are defined as objects, being equipment, containers, packaging and various utensils which are clearly intended to be used for the manufacture, preparation, conservation, flow, transport or handling of foodstuffs [1,2]. Plastic materials are widely used in food packaging applications; however, there is an increasing concern because of the possible release of undesirable components into foodstuffs. During the production of these plastics, several compounds can occur, either intentionally added substances (IAS) like monomers and production chemicals (i.e., antioxidants) or the so-called non-intentionally added substances (NIAS), which are generated as a result of reaction and degradation processes or due to the presence of impurities in the raw materials used for the packaging production. This category of substances might include up to several thousands of compounds, from which the vast majority is unknown. Safety could be threatened by this potentially large number of unknown substances occurring in virgin, processed or recycled plastic FCM. Consequently,



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