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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.*

Lega di nichel in acciaio al carbonio: fondamenti e applicazioni

Il nichel è un elemento di lega importante e ampiamente utilizzato negli acciai al carbonio. Alcuni dei suoi importanti effetti metallurgici in questi acciai sono un moderato rafforzamento della soluzione solida, una lieve temprabilità e, soprattutto, una forte promozione della tenacità, specialmente a basse temperature. I primi usi del nichel come elemento di lega nella produzione commerciale di acciaio risalgono agli inizi del 20 ° secolo. Lo scopo della presente revisione è quello di fornire al lettore una panoramica completa e concisa delle funzionalità del nichel rilevanti per la moderna produzione di acciaio al carbonio.



alloys



Review

Nickel Alloying in Carbon Steel: Fundamentals and Applications

Hardy Mohrbacher ^{1,2,*} and Andreas Kern ³

¹ NiobelCon BV, Swaenebeecklaan 5, 2979 Schilde, Belgium

² KU Leuven, MTM, De Croylaan, 3001 Heverlee, Belgium

³ Thyssenkrupp Steel Europe AG, Kaiser-Wilhelm-Str. 100, 47166 Duisburg, Germany

* Correspondence: hm@niobelcon.net

Abstract: Nickel is an important and widely used alloying element in carbon steels. Some of its prominent metallurgical effects in these steels are moderate solid solution strengthening, mild hardenability and, importantly, a strong promotion of toughness, especially at low temperatures. The first uses of nickel as an alloying element in commercial steel production date back to the early 20th century. The aim of the current review is to give the reader a thorough and concise overview of nickel functionalities relevant to modern carbon steel production. The interaction of nickel with other alloying elements and processing conditions is also considered. Examples will be given demonstrating the advantages of nickel alloying in selected steel grades and applications.

Keywords: solid solution; transformation; strengthening; toughness; welding; fatigue; corrosion; hot shortness; HSLA steel; cryogenic steel

1. Introduction

Nickel belongs to the group of industrial metals and is used in a wide variety of commercial and industrial applications. The metal is extracted by large-scale mining operations to an annual amount of 2.4 million metric tons (reference year 2020). According to current growth scenarios, the global first-use nickel consumption is expected to nearly double, reaching 4.7 million tons by the year 2030. The global demand of nickel is dominated by stainless steel production (currently 73%) while battery applications (currently 8%) are mainly driving its future growth rate [1]. Carbon steel production, however, consumes only about 3% of the annual nickel volume.

Nickel (atomic number 28) is part of the transition metals range in the periodic table [2].



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Sviluppo e convalida di un metodo HPLC-UV per la determinazione dell'estere di bis (2-etilesile) ftalato nelle bevande alcoliche

E' stato sviluppato un metodo HPLC con rilevatore UV per la determinazione dell'estere dello ftalato DEHP nella bevanda alcolica "Ouzo". Gli esteri di ftalati vengono aggiunti agli imballaggi in plastica per alimenti e bevande per aumentare la flessibilità, la trasparenza, la resistenza e la longevità. Quando queste sostanze entrano in contatto con alimenti o bevande, possono portare alla migrazione di residui di ftalati nel prodotto. Questo documento presenta un processo in due fasi che prevede l'estrazione del campione con esano e la separazione degli ftalati mediante HPLC. Il metodo è stato convalidato per specificità, linearità, limite di quantificazione, accuratezza, precisione, portata e robustezza.



Article

Development and Validation of an HPLC-UV Method for the Determination Bis(2-ethylhexyl) Phthalate Ester in Alcoholic Beverages

Evangelos G. Gemenetis¹ and Nikiforos A. Alygizakis^{2,*} 

¹ Internal Quality Control Laboratory, Distillery Winery of Thrace S.A., Industrial Area of Komotini, 69100 Komotini, Greece

² Laboratory of Analytical Chemistry, Department of Chemistry, National and Kapodistrian University of Athens, Panepistimiopolis Zografou, 15771 Athens, Greece

* Correspondence: nalygizakis@chem.uoa.gr; Tel.: +30-210-7274722

Abstract: An HPLC method with UV detector was developed for the determination of DEHP phthalate ester in the alcoholic beverage "Ouzo". Phthalate esters are added to plastic packaging for food and beverages to increase flexibility, transparency, strength, and longevity. When these substances come into contact with food or beverages, they can lead to the migration of phthalate residues into the product. This paper presents a two-step process involving extraction of the sample with hexane and separation of the phthalates by HPLC. The method was validated for specificity, linearity, limit of quantification, accuracy, precision, range, and ruggedness. The linear range is 0.3–1.5 mg/L DEHP, with a lower limit of quantification of 0.06 mg/L. The precision study showed acceptable RSD values, and the working range is 0.3 to 1.5 mg/L DEHP. The relative standard uncertainty of DEHP determination in Ouzo was $\pm 8\%$. The results show that the in-house method is suitable, reliable, and fit-for-purpose.

Keywords: HPLC; UV detector; DEHP; phthalate ester; Ouzo; plastic packaging; method performance; uncertainty calculation



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Sfide nella produzione sostenibile di bovini da carne: un sottoinsieme dei progressi necessari

Le stime della crescita della popolazione globale sono spesso citate come una sfida significativa per la produzione alimentare globale. Si stima che entro il 2050 ci saranno circa due miliardi di persone in più sulla terra, con la maggior parte di tale crescita che si verificherà in Africa centrale. Per soddisfare il fabbisogno proteico futuro raccomandato (60 g/giorno), devono essere prodotti circa 120 milioni di kg di proteine al giorno. La produzione di carne di ruminanti (in particolare bovini da carne) offre il potenziale per contribuire a raggiungere un maggiore fabbisogno proteico globale. Tuttavia, i progressi nella produzione di bovini da carne sono necessari per garantire la sostenibilità futura del settore.



Article

Challenges in Sustainable Beef Cattle Production: A Subset of Needed Advancements

Jason A. Hubbard ^{1,*} , Nathan Blake ², Ida Holásková ³, Domingo Mata Padrino ² , Matthew Walker ^{3,4} and Matthew Wilson ⁵ 

¹ Division of Forestry and Natural Resources, Davis College of Agriculture, Natural Resources and Design, West Virginia University, Agricultural Sciences Building, Morgantown, WV 26506, USA

² Division of Plant and Soil Sciences, Davis College of Agriculture, Natural Resources and Design, West Virginia University, Agricultural Sciences Building, Morgantown, WV 26506, USA

³ Office of Statistics and Data Analytics, West Virginia Agriculture and Forestry Experiment Station, Davis College of Agriculture, Natural Resources and Design, West Virginia University, 1194 Evansdale Drive, Morgantown, WV 26506, USA

⁴ Division of Resource Economics and Management, School of Natural Resources, Davis College of Agriculture, Natural Resources and Design, West Virginia University, 1194 Evansdale Drive, Morgantown, WV 26506, USA

⁵ Division of Animal and Nutritional Sciences, Davis College of Agriculture, Natural Resources and Design, West Virginia University, Agricultural Sciences Building, Morgantown, WV 26506, USA

* Correspondence: jason.hubbart@mail.wvu.edu; Tel.: +1-304-293-2472

Abstract: Estimates of global population growth are often cited as a significant challenge for global food production. It is estimated that by 2050 there will be approximately two billion additional people on earth, with the greatest proportion of that growth occurring in central Africa. To meet recommended future protein needs (60 g/d), approximately 120 million kg of protein must be produced daily. The production of ruminant meat (particularly beef cattle) offers the potential to aid in reaching increased global protein needs. However, advancements in beef cattle production are necessary to secure the industry's future sustainability. This article draws attention to a subset of sustainable beef cattle production challenges, including the role of ruminant livestock in meeting global human protein needs, the environmental relationships of advanced beef cattle production, and big data and machine learning in beef cattle production. Considering the significant quantities of resources necessary to produce this form of protein, such advancements are not just a moral imperative but critical to developing advanced beef cattle production practices and predictive models that will reduce costs and liabilities and advance industry sustainability.



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Ottimizzazione del confezionamento in atmosfera modificata per spicchi di formaggio semiduro di latte ovino durante lo stoccaggio refrigerato: proprietà fisico-chimiche e sensoriali

Il confezionamento in atmosfera modificata (MAP) è diventato una buona strategia potenziale per mantenere la qualità per tutta la durata di conservazione degli alimenti deperibili. Lo scopo di questo lavoro è stato quello di valutare diverse atmosfere di confezionamento su spicchi di formaggio Idiazabal a denominazione di origine protetta semidura. Sono state studiate miscele di gas nel rapporto di 20/80, 50/50, 80/20 e 100/0% V/V, rispettivamente). Miscele MAP con CO₂ concentrazione tra 50/50 e 80/20% di CO₂/N₂ (v/v) sono raccomandati per garantire qualità sensoriale e stabilità nella distribuzione di questi spicchi di formaggio crudo di latte ovino.



Article

Optimization of Modified Atmosphere Packaging for Sheep's Milk Semi-Hard Cheese Wedges during Refrigerated Storage: Physicochemical and Sensory Properties

Marta Albisu ¹, Sonia Nieto ² , Olaia Martinez ³ , Maria Ángeles Bustamante ¹ , Luis Javier R. Barrón ¹ and Ana Isabel Nájera ^{1,*}

¹ Lactiker Research Group, Faculty of Pharmacy, Universidad del País Vasco/Euskal Herriko Unibertsitatea, 01006 Vitoria-Gasteiz, Álava, Spain

² Efficient and Sustainable Processes Department, Bizkaia Technology Park, AZTI, P.O. Box 609, 48160 Derio, Bizkaia, Spain

³ Texture Analysis Laboratory, G3S Research Group, Faculty of Pharmacy, Universidad del País Vasco/Euskal Herriko Unibertsitatea, 01006 Vitoria-Gasteiz, Álava, Spain

* Correspondence: anaisabel.najera@ehu.es; Tel.: +34-945-013-077



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Abstract: Modified atmosphere packaging (MAP) has become a good potential strategy to retain quality throughout the shelf life of perishable foods. The aim of this work was to evaluate different packaging atmospheres on semi-hard protected designation of origin Idiazabal cheese wedges. Six different packaging treatments (air, vacuum, and CO₂/N₂ gas mixtures in the ratio of 20/80, 50/50, 80/20, and 100/0% v/v, respectively) were studied. Changes in gas headspace composition, cheese gross composition, weight loss, pH, acidity, colour, and textural and sensory properties were investigated during 56 days of refrigerated storage at 5 ± 1 °C. MAP was the most effective preserving technique compared to air- and vacuum-packaging treatments. The cheese characteristics with the greatest discriminating weight in the preservation techniques were paste appearance, holes, flavour, a* (redness) and b* (yellowness) colour parameters, and slope to hardness. Air-packaged cheeses, on 35 day, presented a mouldy flavour. Vacuum packaging affected paste appearance (greasy, plastic marks, and non-homogeneous colour) and holes (occluded and unnatural appearance) starting after 14 packaging days. MAP mixtures with CO₂ concentration between 50/50 and 80/20% CO₂/N₂ (v/v) are recommended to ensure sensory quality and stability in the distribution of these raw sheep-milk cheese wedges.

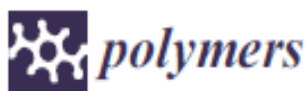
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Adesivi a base biologica formulati con acido tannico, chitosano e gommalacca per materiali di imballaggio

Lo scopo di questo studio era quello di sviluppare adesivi a base biologica che possono essere utilizzati per varie carte da imballaggio. Oltre ai campioni di carta commerciale, sono state utilizzate carte prodotte da specie vegetali nocive in Europa, come il poligono giapponese e la verga d'oro canadese. In questa ricerca, sono stati sviluppati metodi per produrre soluzioni adesive a base biologica in combinazioni di acido tannico, chitosano e gommalacca. I risultati hanno mostrato che la viscosità e la forza adesiva degli adesivi erano migliori nelle soluzioni con aggiunta di acido tannico e gommalacca. La resistenza alla trazione con adesivi di acido tannico e chitosano era migliore del 30% rispetto agli adesivi commerciali e del 23% per le combinazioni di gommalacca e chitosano.



Article

Bio-Based Adhesives Formulated from Tannic Acid, Chitosan, and Shellac for Packaging Materials

Urška Vrabič-Brodnjak

Department of Textiles, Graphic Arts and Design, Faculty of Natural Sciences and Engineering, University of Ljubljana, 1000 Ljubljana, Slovenia; urska.vrabic@ntf.uni-lj.si; Tel: +386-(1)-200-32-82

Abstract: The aim of this study was to develop bio-based adhesives that can be used for various packaging papers. In addition to commercial paper samples, papers produced from harmful plant species in Europe, such as Japanese Knotweed and Canadian Goldenrod, were used. In this research, methods were developed to produce bio-based adhesive solutions in combinations of tannic acid, chitosan, and shellac. The results showed that the viscosity and adhesive strength of the adhesives were best in solutions with added tannic acid and shellac. The tensile strength with adhesives of tannic acid and chitosan was 30% better than with commercial adhesives and 23% for combinations of shellac and chitosan. For paper from Japanese Knotweed and Canadian Goldenrod, the most durable adhesive was pure shellac. Because the surface morphology of the invasive plant papers was more open and had numerous pores compared to the commercial papers, the adhesives penetrated the paper structure and filled the voids. There was less adhesive on the surface and the commercial papers achieved better adhesive properties. As expected, the bio-based adhesives also showed an increase in peel strength and exhibited favorable thermal stability. In summary, these physical properties support the use of bio-based adhesives use in different packaging applications.

Keywords: adhesives; chitosan; tannic acid; shellac; Japanese Knotweed; Canadian Goldenrod; paper; packaging; material analysis

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Una revisione sugli imballaggi antimicrobici per prolungare la durata di conservazione degli alimenti

Sistemi di imballaggio alimentare sono continuamente influenzati dalla crescente domanda di alimenti minimamente trasformati, dal cambiamento delle abitudini alimentari e dai rischi per la sicurezza alimentare. Gli alimenti minimamente trasformati sono inclini alla crescita di microbi dannosi, compromettendo la qualità e la sicurezza. Di conseguenza, la necessità di migliorare la durata di conservazione degli alimenti e la protezione contro le malattie di origine alimentare, unitamente alla preferenza dei consumatori per alimenti minimamente trasformati con additivi sintetici nulli o inferiori, favoriscono lo sviluppo di tecnologie innovative come gli imballaggi antimicrobici. È una forma di imballaggio attivo che può rilasciare sostanze antimicrobiche per sopprimere le attività di microrganismi specifici, migliorando così la qualità e la sicurezza degli alimenti durante la conservazione a lungo termine.



processes



Review

A Review on Antimicrobial Packaging for Extending the Shelf Life of Food

Tobi Fadiji ¹, Mahdi Rashvand ², Michael O. Daramola ¹ and Samuel A. Iwarere ^{1,*}

¹ Department of Chemical Engineering, Faculty of Engineering, Built Environment and Information Technology, University of Pretoria, Pretoria 0002, South Africa

² School of Agriculture, Forestry, Food and Environmental Science, University of Basilicata, 85100 Potenza, Italy

* Correspondence: samuel.iwarere@up.ac.za

Abstract: Food packaging systems are continually impacted by the growing demand for minimally processed foods, changing eating habits, and food safety risks. Minimally processed foods are prone to the growth of harmful microbes, compromising quality and safety. As a result, the need for improved food shelf life and protection against foodborne diseases alongside consumer preference for minimally processed foods with no or lesser synthetic additives foster the development of innovative technologies such as antimicrobial packaging. It is a form of active packaging that can release antimicrobial substances to suppress the activities of specific microorganisms, thereby improving food quality and safety during long-term storage. However, antimicrobial packaging continues to be a very challenging technology. This study highlights antimicrobial packaging concepts, providing different antimicrobial substances used in food packaging. We review various types of antimicrobial systems. Emphasis is given to the effectiveness of antimicrobial packaging in various food applications, including fresh and minimally processed fruit and vegetables and meat and dairy products. For the development of antimicrobial packaging, several approaches have been used, including the use of antimicrobial sachets inside packaging, packaging films, and coatings incorporating active antimicrobial agents. Due to their antimicrobial activity and capacity to extend food shelf life, regulate or inhibit the growth of microorganisms and ultimately reduce the potential risk of health hazards, natural antimicrobial agents are gaining significant importance and attention in developing antimicrobial packaging systems. Selecting the best antimicrobial packaging system for a particular product depends on its nature, desired shelf life, storage requirements, and legal considerations. The current review is expected to contribute to research on the potential of antimicrobial packaging to extend the shelf life of food and also serves as a good reference for food innovation information.

Keywords: food packaging; antimicrobial agent; active packaging; shelf life; fruit and vegetables; meat products



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Riciclo dei rifiuti di imballaggio in polistirene post-consumo in nuove applicazioni di imballaggio alimentare - Parte 1: Contatto diretto con gli alimenti

L'aumento del riciclo della plastica è un prerequisito essenziale per la transizione verso un'economia circolare. Il polistirene (PS) è un polimero a bassa diffusione e quindi un candidato promettente per il riciclo a contatto con gli alimenti simile al polietilene tereftalato (PET). Tuttavia, tale riciclo delle tazze PS non è stato finora stabilito su scala commerciale. Anche se si desidera riciclare nuovamente a contatto con gli alimenti, la salute del consumatore non deve essere a rischio. Di conseguenza, i processi di riciclo devono essere sottoposti a una valutazione conservativa da parte delle autorità competenti. Per PS, tuttavia, i criteri di valutazione non vengono pubblicati, il che rappresenta uno svantaggio per gli sviluppatori di processi. Nell'ambito dello studio, i riciclati di PS post-consumo sono stati valutati in modo simile ai criteri di valutazione esistenti per PET e HDPE.



recycling



Article

Recycling of Post-Consumer Polystyrene Packaging Waste into New Food Packaging Applications—Part 1: Direct Food Contact

Frank Welle 

Fraunhofer Institute for Process Engineering and Packaging IVV, Giggenhauser Straße 35,
85354 Freising, Germany; frank.welle@ivv.fraunhofer.de

Abstract: The increase in plastic recycling is an essential pre-requisite for the transition to a circular economy. Polystyrene (PS) is a low diffusive polymer and therefore a promising candidate for recycling back into food contact similar to polyethylene terephthalate (PET). However, such a recycling of PS cups has been not established to date on a commercial scale. Even if recycling back into food contact is desired, the health of the consumer must not be at risk. As a consequence, recycling processes must go through a conservative assessment by relevant authorities. For PS, however, evaluation criteria are not published, which is a drawback for process developers. Within the study, post-consumer PS recyclates were evaluated in a similar way to existing evaluation criteria for PET and HDPE. For the recycling of post-consumer PS back into packages with direct contact with food, there are still some points open which cannot be answered conclusively today. Upon closer inspection, there appears to be enough information available to give a first indication as to whether recycling of post-consumer PS packaging materials back into direct food contact can be considered safe. The knowledge gaps in PS recycling were determined and discussed.

Keywords: high impact polystyrene; migration; yogurt cups; exposure evaluation

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Via Cosimo Del Fante 10 - 20122 Milano - Tel. +39 02 58319624

C.F: 97870780158

segreteria@fondazionepackaging.org - www.fondazionecartaeticapackaging.org