Hot Articles

"October | 2019"

Science and Technology

Abstract

Pulse grains were identified as a key resource for food innovation during the International Year of the Pulse (IYP), 2016. Pulse flour offers a sustainable source of plant protein for innovation in protein enriched cereal based foods. Fava-bean (Vicia faba), green- and yellow-pea (Pisum sativum) flour were analysed for proximate composition, minerals, amino acids, phenolic content, phytic acid and trypsin inhibitory activity. Fava-bean flour had the highest protein content (28 g/100 g), while green-pea flour had the highest total dietary fibre content (15 g/100 g). All three flours contained essential amino acids in adequate quantity, highlighting them as a source of good quality protein for in the formulation of protein-enriched foods. Fava-bean flour had significantly higher phenolic content and antioxidant activity than pea flours (387 mg GAE/100 g and 250 mg AAE/100 g respectively). Pulse flour contained high levels of potassium and zinc, while fava-bean flour was also high in iron. Phytic acid ranged from 543 to 889 mg/100 g; the lowest of which was observed in green-pea flour. Green-pea flour also exhibited the lowest trypsin inhibition (3.7 TIU/mg). Results demonstrate the significant potential of pulse flour to enhance the nutritional value of cereal based foods which is not possible with wheat flour alone.

Database

Title:	Comparative study of plant protein extracts as wall materials for the improvement of the oxidative stability of sunflower oil by microencapsulation
Author:	L. Le Priol	A. Dagmey	S. Morandat	K.Saleh	K. El Kirat	A. Nesterenko
Journal:	Food Hydrocolloids

Abstract

This study investigated the potential of five commercially available plant protein extracts (pea protein isolate, soybean protein isolate, brown rice protein, hemp protein and sunflower protein) as wall materials for the microencapsulation of sunflower oil by spray drying. Emulsions were prepared with 10% w/v of protein extracts and 10% w/v of sunflower oil (core/wall materials ratio 1:1). No organic solvent or surfactant were used in the preparation process. The main objective of this microencapsulation was to improve the oxidative stability of sunflower oil. This parameter was evaluated by accelerated oxidative tests with the Rancimat method. Based on this technique, the induction period (IP) was calculated, corresponding to the stability time of the sample while heated at a certain temperature, and compared to the IP of non-encapsulated oil (9.50 h). Additional analyses for the characterization of the oil in water emulsions and dried microparticles were also performed. Results showed that sunflower oil encapsulated in pea protein isolate had the best oxidative stability (21.26 h), followed by microparticles made of soybean protein isolate (12.49 h). The formulation with hemp protein extract had no significant effect on the oxidative stability of sunflower oil (9.72 h) and the use of sunflower and brown rice protein extracts decreased the induction time of sunflower oil (7.20 and 6.97 h, respectively). These results were related to the protein fractions compositions and their influences on the diffusivity and film forming properties of the plant protein extracts.

Database

Title: [Emerging regulatory mechanisms and functions of autophagy in fish](#)

Author: Xiaojing Xia | Xin Wang | Wanhai Qin | Jinqing Jiang | Likun Cheng

Journal: Aquaculture

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Doi: https://doi.org/10.1016/j.aquaculture.2019.734212

Abstract

Autophagy is a bulk subcellular degradation process through which eukaryotic cells maintain health by forming autophagosomes and recycling intracellular substances. This particular process is an important mechanism for cell survival, growth, differentiation, development and homeostasis. Over the past few decades, studies on yeast and mammalian autophagy have greatly increased our understanding of autophagy and its relationship with human health and disease. However, our understanding of autophagy in fish cells is limited. Recent studies have made some progress in investigating the induction of autophagy in fish cells, the expression and regulation of autophagy-related genes, and the role of autophagy under conditions of pathogen infection. In particular, genetically modified zebrafish and zebrafish cell lines have been constructed as models to investigate the role of autophagy in developmental regulation, resistance to pathogen infection, lipid degradation and other physiological and pathological responses in fish. Understanding fish autophagy will aid in the prevention and treatment of related diseases by enabling the manipulation of autophagy levels in cells to improve fish health. Here, we review the most recent discoveries concerning autophagy in fish.

Database

ScienceDirect

Title: [High-Strength, Low-Permeable, and Light-Protective Nanocomposite Films Based on a Hybrid Nanopigment and Biodegradable PLA for Food Packaging Applications](#)

Abstract

Herein, a multifunctional filler, a dye (organic)–clay (inorganic) hybrid nanopigment (DCNP), was embedded into polylactic acid (PLA) to fabricate a colored biodegradable/biocompatible film, which is explored as a high thermomechanical resistant as well as a superior light and mass transport barrier for food packaging applications. In this respect, the DCNP was synthesized through a wet chemical process with a reaction yield of 76% and incorporated into a PLA matrix at various concentrations using a solution casting method. The morphological characterizations revealed partially intercalated/exfoliated structure for PLA–DCNP films. The samples filled with DCNP showed up to 20% and 12 °C improvements in storage modulus (E′) and glass transition temperature (Tg), respectively, compared to those with neat PLA. Incorporation of a small amount of DCNP into the PLA matrix significantly declined the water vapor and gas permeability of PLA by 36 and 54%, respectively. The optical property investigations indicated remarkable color characteristics and light protection performance of the samples containing DCNP. The results also showed better performance of the PLA–DCNP film compared to that of the PLA–Cloisite 20A sample at an identical filler loading. In conclusion, the desirable properties of the resulting films highlighted the potential application of such nanocomposite films as a promising option for food packaging materials.

Database

Title: [PM$_{2.5}$-Associated Health Impacts of Beehive Coke Oven Ban in China](https://doi.org/10.1021/acs.est.9b04282)

Author: Yang Xu | Qirui Zhong | Xiao Yun | Huizhong Shen | Guofeng Shen | Junfeng Liu | Jianmin Ma | Jianying Hu | Yi Wan | Xuejun Wang | Chongguo Tian | Shu Tao

Abstract

Historically, beehive coke ovens (BCOs) were extensively operated in China and emitted large quantities of pollutants, including primary PM2.5 and secondary PM2.5 precursors, and other climate forcers. Although these ovens were legally banned in 1996 by the Coal Law, the process of phasing them out took over a decade to accomplish. Based on historical operation data derived from remote sensing images, temporal trends and the spatial distribution of the emissions of various pollutants from BCOs were compiled and used to model the resulting perturbation in ambient PM2.5, population exposure, and PM2.5-associated adverse health impacts. Historically, PM2.5 originating from BCOs affected a vast region across China, which peaked in approximately 1996 and decreased afterward until the ovens' final elimination in 2011. According to the results of a supply–demand model, emissions from the BCOs would have continued to increase after 1996 if they had not been banned. As a result, national average PM2.5 attributable to BCOs in 2014 would have been more than three times as high as that in 1996. It was estimated that the cumulative number of premature deaths associated with BCO-originating PM2.5 from 1982 to 2014 was as high as 365 000 (95% confidence interval 259 000–402 000). The number would have nearly tripled if BCOs had not been banned and halved if the ban had been implemented immediately after the regulation was in force, suggesting the importance of legislation implementation.

Database

American Chemical Society Journal (ACS)

Title:	[Polybutadiene Vitrimers Based on Dioxaborolane Chemistry and Dual Networks with Static and Dynamic Cross-links](https://doi.org/10.1021/acs.macromol.9b01288)
Author:	Antoine Breuillac	Alexis Kassalias	Renaud Nicolaÿ
Journal:	Macromolecules

Abstract

Vitrimers are polymer networks able to change their topology through degenerate exchange reactions. As a result, they behave like elastic solids when the topology of the network is frozen and like viscoelastic liquids at high temperatures. Controlling the dynamics of molecular exchange is essential to regulate the solid-to-liquid transition temperature in elastomeric vitrimers. In this study, such materials were prepared by the radical grafting of a bis-thiol dioxaborolane onto a low molar mass unentangled polybutadiene. All the resulting elastomeric vitrimers fully relax stress and are reprocessable and recyclable. Because of the low molar mass of the thermoplastic precursor, the low number of cross-links per chain, and the dynamics of the dioxaborolane exchange reaction, these vitrimers dissolve in tetrahydrofuran after prolonged immersion time at room temperature. Creep-recovery experiments at various temperatures show that both the viscosity and the viscosity activation energy of vitrimers can be controlled by manipulating the cross-linking density. This feature offers a new perspective on developing vitrimers with improved creep resistance at service temperatures and desirable flow properties at processing temperatures. In order to prepare reprocessable elastomers with improved creep resistance, we prepared dual networks that feature both dynamic and static cross-links. Even with fractions of static cross-links sufficient to form a percolated network, these dual networks are fully recyclable and exhibit strong adhesion with welding times as short as 2 min at 150 °C.

Database

American Chemical Society Journal (ACS)

Abstract

Two RP-HPLC methods were developed, optimized, and validated for the determination of two different anti-hypertensive combinations in the presence of their degradation products or impurities and in their pharmaceutical formulations. The first mixture is Ramipril (RAM) in combination with Amlodipine besylate (AML) [mixture I], while the second one is a combination of Ramipril (RAM), Atorvastatin (ATV), and Aspirin (ASP) [mixture II].The proposed combinations were successfully separated on X-bridge C18column (250 × 4.6 mm i.d, 5 μm p.s.), using a mobile phase of 0.05 M phosphate buffer-acetonitrile-THF (60:40:0.1% by volume) pH 2.5 and an isocratic mobile phase formed of acetonitrile-0.05 M phosphate buffer-THF (60:40:0.1% by volume) pH 2.5 for mixture (I) and (II) at a flow rate of 1 mL/min and 1.2 mL/min, respectively. The compromising components of the mixtures were detected at 218 nm. For the best separation of the mentioned components different parameters were examined and optimized. The two suggested methods were validated in compliance with the ICH guidelines and were successfully applied for the quantification of the cited components in presence of their obtained degradation products as well as in their commercial pharmaceutical formulations. For both methods the obtained results were statistically analyzed and compared to those of the official and reported methods; using Student's t test and F test showing no significant difference with high accuracy and good precision.

Database

SpringerLink

Title: [Impact of exterior convective heat transfer coefficient models on the energy demand prediction of buildings with different geometry](#)

Author: Samy Iousef | Hamid Montazeri | Bert Blocken | Pieter van Wesemael

Abstract

Accurate models for exterior convective heat transfer coefficients (CHTC) are important for predicting building energy demand. A detailed review of the literature indicates that existing CHTC models take into account the impact of building geometry either incompletely, or not at all. To the best of our knowledge, research on the impact of exterior CHTC models on the predicted energy performance of buildings with different geometry has not yet been performed. This paper, therefore, investigates the influence of CHTC models on the calculated energy demand of buildings with varying geometry. Building energy simulations are performed for three groups: buildings with H_b (building height) > W_b (building width), buildings with H_b < W_b and buildings with H_b = W_b. Six commonly used CHTC models and a new generalized CHTC model are considered. The generalized CHTC model is expressed as a function of H_b and W_b. The simulations are performed for low and high thermal resistances of the building envelope. The results show that the different CHTC models provide significantly different predictions for the building energy demand. While for annual heating demand, deviations of −14.5% are found, for the annual cooling demand a maximum deviation of +42.0% is obtained, compared to the generalized CHTC model. This study underlines the need for the CHTC models to consider building geometry in their expressions, especially for high-rise buildings. For low-rise builgings, the observed deviations between the existing and the generalized CHTC model are less pronounced.

Database

Title: [High Voltage Gain Quasi-Switched Boost Inverters With Low Input Current Ripple](#)

Author: Minh-Khai Nguyen | Truong-Duy Duong | Young-Cheol Lim | Joon-Ho Choi

Journal: IEEE Transactions on Industrial Informatics

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Doi: https://doi.org/10.1109/TII.2018.2806933

Abstract

Two high voltage gain quasi-switched boost inverters (HG-qSBIs) are introduced in this paper. The proposed HG-qSBIs has the following characteristics: 1) continuous input current with low ripple; 2) reduced voltage stress on the capacitor, switch, and diodes; 3) shoot-through immunity; 4) achieved high voltage gain with single-stage conversion; and 5) improve the output voltage capability with using high modulation index. A novel pulse-width modulationcontrol technique is proposed for the introduced HG-qSBI. Operating principle, circuit analysis, and passive component design guideline of the HG-qSBI are addressed. Comparison analysis between the introduced HG-qSBI and other Z-source-based high voltage gain inverters is presented. A prototype is made to test the introduced HG-qSBI. Simulation and experimental verifications are shown to prove the accuracy of the theoretical analysis.

Database

IEEE/IET Electronic Library (IEL)

Title: Secrecy Rate Maximization for Intelligent Reflecting Surface Assisted Multi-Antenna Communications

Author: Hong Shen ; Wei Xu ; Shulei Gong ; Zhenyao He ; Chunming Zhao

Journal: IEEE Communications Letters

Abstract

We investigate transmission optimization for intelligent reflecting surface (IRS) assisted multi-antenna systems from the physical-layer security perspective. The design goal is to maximize the system secrecy rate subject to the source transmit power constraint and the unit modulus constraints imposed on phase shifts at the IRS. To solve this complicated non-convex problem, we develop an efficient alternating algorithm where the solutions to the transmit covariance of the source and the phase shift matrix of the IRS are achieved in closed form and semi-closed form, respectively. The convergence of the proposed algorithm is guaranteed theoretically. Simulation results validate the performance advantage of the proposed optimized design.

Database