High-Pressure CO2 as a Green Solvent for Extraction, Reaction, Particle Formation and Others Processes

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Book of Abstracts

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Editors

unctional and nutritional properties of
ein.
nzymatic cross-linking of globulin de-
l from pumpkin oil cake was stu-
using microbial transglutaminase.
response surface methodology was
loyed for investigation of effect of en-
e/substrate ratio, temperature and re-
n time on reaction of cross-linking,
ured by degree of polymerization
as response. The second-order poly-
al model showed good fit with the ex-
ental data (R^2=0.9297). A reaction
of 39.2 min, E/S ratio of 1/4.9 (w/w)
mperature of 28 °C, were found to be
al conditions to achieve the highest
of DP (69 %). The solubility and
on properties of the transglutaminase
linked proteins with different values
were assessed for improvement. The
ility and gelation properties of poly-
ed proteins were improved over the
nge 5.0-8.0. The highest solubility
hieved at DP of 60 %, at pH 7.0 and
4 fold higher than solubility of un-
ed protein. The greatest decrease of
elation concentration has been made
9.0 (for 50 %).

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Extraction of bioactive phenolic compounds from plants and effects of extract of lipid oxidation

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Interest in the development of bioprocesses for the production or extraction of bioactive compounds from natural sources has increased in recent years due to the potential applications of these compounds in food, chemical, and pharmaceutical industries.

In the present study, after generalization of basic aspects about natural and synthetic antioxidants, preliminary results on the extraction of bioactive phenolic compounds from natural plants and incorporation of obtained extracts into composition of vegetable oils to increase its oxidation stability during heat treatment process are reported.

Extracts of plants were prepared in ethanol/water mixtures, total polyphenol content (TPC) and DPPH antioxidant activity were determined spectrophotometrically. Being highest in TPC and DPPH antioxidant potential, plant extracts were added to the composition of sun flower and grape seeds oils. The oxidation degree of the tested vegetable oils by means of free fatty acids and hydroperoxides content, *p*-anisidine value and TBARS concentration was evaluated. This study demonstrates that natural plant extracts with high content of bioactive phenolic compounds can effectively inhibit the lipid oxidation of vegetable oils in thermal oxidation conditions.

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High-pressure CO_2 as a green solvent for extraction, reaction, particle formation and other processes

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Carbon dioxide above its critical point (31.1 °C, 7.4 MPa) is a fluid of solvent power adjustable in a wide range by pressure and temperature and therefore of higher selectivity than conventional organic solvents. Compared to them, it is cheap, non-toxic, non-explosive, and non-flammable, and easy to be separated from the extract. The process preserves valuable thermolabile components as neither substrate nor extract are exposed to high temperatures during the extraction and separation. New applications of pressurised CO_2 emerge: as reaction medium it increases the rate and specificity of both chemical and enzymatic reactions due to its excellent transport properties; micro- and nanoparticles, including composite particles, of controlled size are prepared by fast ex-

pansion of pressurised solutions of biologically active substances; quality of microfibres used as scaffold for living cells is improved when they are produced under pressurised CO_2, etc. The Laboratory of Supercritical Fluids of the Institute of Chemical Process Fundamentals has been engaged in the extraction of biologically active substances from plants and in enzymatic reactions of vegetable oils in a continuous-flow packed bed reactor. The results are summarised in the poster. Though these studies will continue, the scientists are ready to extend their research to new areas of pressurised CO_2 application in bioprocessing.

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Innovative design for the continuous lactic acid and xylitol production from trimming vineshoots hemicellulosic hyrdolysates

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An innovative system was developed in this study for the efficient valorisation of trimmings vineshoots hemicellulosic hydrolysates. Connecting two reactors of 2 and 10 L respectively, the operational conditions were set up for the sequential production of lactic acid and xylitol in continuous fermentation without biomass removed. In the first bioreactor, *Lactobacillus rhamnosus* consumed all the glucose to produce lactic acid at 31.5 °C, 150 rpm and 1 L of working volume as the optimal conditions. The residual sugars were employed for the xylose to xylitol bioconversion by *D. hansenii* in the second bioreactor at 30 °C, 250 rpm and air flow rate of 2 L/min. Several steady states were reached at flow rates (F) in the range 0.54 to 5.33 mL/min leading to dilution rates (D) ranging from 0.032 to 0.320 h^{-1} in bioreactor 1 and 0.006 to 0.064 h^{-1} in bioreactor 2. The maximum volumetric lactic acid productivity (QP LA = 2.908 g/L·h) was achieved under D = 0.266 h^{-1} (F = 4.44 mL/min) meanwhile the maximum production of xylitol (5.1 g/L), volumetric xylitol productivity (QP xylitol = 0.218 g/L·h), volumetric rate of xylose consumption (QS xylose = 0.398 g/L·h) and product yield (0.55 g/g) were achieved at an intermediate dilution rate of 0.043 h^{-1} (F = 3.55 mL/min). Under these conditions, ethanol, the main by-product of the fermentation was produced in higher amounts (1.9 g/L). Finally, lactic acid and xylitol were effectively recovered by conventional procedures.

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Interaction of calf thymu DNA with an anti-virul dru lamivudine

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This paper provided an approach for st dying the anticancer potential of an anti ral drug lamivudine (LA). The interacti of LA and calf thymus DNA (CT-DN was studied using emission, absorption, rcular dichroism and viscosity techniqu The binding constants evaluated from fl rescence data at different temperatures vealed that fluorescence enhancement static process that involves complex – D formation in the ground state. Further, enthalpy and entropy of the reaction tween the drug and CT-DNA showed $\Delta H < 0$ (-126.377 kJ mol^{-1}) and ΔS 0 (-352.173 J mol^{-1} K^{-1}), therefore der Waals interactions or hydrogen bo are the main forces in the binding of LA to CT – DNA. The values of Kf cle underscore the remarkably high affini LA to DNA. In addition, detectable c ges in the circular dichroism spectru CT-DNA in the presence of LA indi conformational changes. All these re showed that the binding mode of this and CT-DNA is groove binding.