

111 Lakeshore Road, Ste. Anne de Bellevue, Que., Canada H9X 3V9), *J Food Eng*, 2009, **92**(3), 353-358].

PULP/PAPER

NPARR 1(1), 2010-94, Dissolving pulp from corn stalk residue and waste water of Merox unit

The aim of this work was to study the production of cellulosic dissolving-grade pulp, alpha-cellulose, using corn stalk residue as non-wood material and industrial waste water as pulping liquid. Industrial waste water obtained from a *Merox* unit operating at the Kermanshah Oil Refinery in Iran and corn stalk residue obtained from local agricultural farms were used as raw materials for the experiment. The pre-hydrolysis process was performed on the corn stalk for 30min at 160°C in a mini-digester. Subsequently, the corn stalk was subjected to Kraft pulping and to pulping with industrial waste water at 170°C over a period of 90min. Upon completion of the bleaching process of each mixture, the quality of the resulting cellulosic dissolving-grade pulps was studied. The laboratory investigation compared the following parameters of importance: influence of active alkali, sulfidity, and dilution ratio of the industrial waste water on pulp properties such as yield, kappa number and degree of polymerization. Under optimum conditions, the pre-hydrolysis/kraft pulping with 20% active alkali, 25% sulfidity and HEHP bleaching resulted in acceptable levels of alpha-cellulose content (94.8%), degree of polymerization (279) and ash content (0.75%) for the produced dissolving pulp. The kraft pulping was compared with the pulping of corn stalk with industrial waste water, which increased the alpha-cellulose content to 97.4%, with a degree of polymerization of 241 and an ash content of 0.96%. Comparison of both experiments indicates that using industrial waste water in the pulping process gives satisfactory results for industrial applications using a non-wood material, yields a quality product with reduced capital investment and operation costs, and considerably helps the environmental preservation of wood-based raw materials [J. Behin^a and M. Zeyghami^a (Department of Chemical Engineering, Faculty of Eng., Razi University, Baghe Abrisham, Kermanshah, Iran), *Chem Eng J*, 2009, **152**(1), 26-35].

NPARR 1(1), 2010-95, Adsorption of cationized barley husk xylan on kraft pulp fibres: influence of degree of cationization on adsorption characteristics

A water-soluble (glucurono)arabinoxylan (GAX) was isolated from barley husk using chlorite delignification followed by alkaline extraction and enzymatic purification of the extract. The isolated xylan was shown to adsorb on bleached softwood kraft fibres, but the degree of adsorption was rather low under the applied conditions. This can be explained by the inhibited adsorption of GAX molecules with a relatively high degree of arabinofuranosyl substitution, as indicated by iodine complexation and neutral carbohydrate analysis of the non-adsorbing xylans. In order to increase the driving force for adsorption of the more highly substituted GAX, the xylan was cationized through a reaction in an aqueous alkaline medium with 2, 3-epoxypropyltrimethylammonium chloride (EPTMAC). The chemical modification of xylan was confirmed by using ¹H-¹³C HSQC (Heteronuclear Single Quantum Coherence) NMR, and was quantified by using elemental analysis. The GAX cationization, which introduced cationic charge densities ranging from 110 to 740 µeq/g, was shown to increase the rate and magnitude of adsorption extensively, due to the induced electrostatic interaction between the anionic fibres and the cationic xylan. Similar to non-modified xylan, cationic xylan possessed a non-electrostatic cellulose surface affinity, as shown by adsorption at high ionic-strength and on esterified (carboxyl-free) pulp fibres [Tobias Köhnke^a, Harald Brelid and Gunnar Westman^a (Organic Chemistry, Department of Chemical and Biological Engineering, Chalmers University of Technology, 412 96 Göteborg, Sweden), *Cellulose*, 2009, **16**(6)].

NPARR 1(1), 2010-96, Effect of anthraquinone on brightness value and crystalline structure of pulp during soda processes

The dependence of crystalline structure and optical properties of pulp on anthraquinone (AQ) added to the soda process at different cooking times was determined in this study. Wheat (*Triticum aestivum* Linn.) straw was used as the raw material for pulp. Soda and soda-AQ processes were selected for pulping at 80 min and

120 min. The soda-AQ process improved the yield and viscosity of pulp delignification ratio for pulping in comparison with the soda process. Crystallinity of pulp samples decreased by adding anthraquinone to the soda process because of stabilized less ordered cellulose and amorphous hemicelluloses in pulp. It was determined that crystallinity of pulp samples decreased with longer cooking time, from 80min to 120min, in both soda and soda-AQ processes. Monoclinic structure was dominant in pulp samples; however, the triclinic structure ratio increased in both soda and soda-AQ processes compared to raw material. It was found that brightness and lightness values in pulp samples decreased when using anthraquinone depending on the changes of the crystalline structure [Esat Gümü_kaya^a, Evren Ersoy Kalyoncu and HüseyinKirci (^aDepartment of Pulp and Paper, Faculty of Forestry, Karadeniz Technical University, 61080, Trabzon, Turkey), *Chemical Papers*, 2009, **63**(6)].

NPARR 1(1), 2010-97, Cellulase production by solid state fermentation using bagasse with *Penicillium decumbens* L-06

The cellulase production by *Penicillium decumbens* L-06 in solid state fermentation (SSF) was investigated using bagasse as the substrate in this paper. The optimum conditions for cellulase production achieved by single factor testing were: the ratio of bagasse to wheat bran 1:1 (w/w), the ratio of water to material 3:1 (v/w), culture temperature 30°C, initial pH 5.0, ammonium sulphate as nitrogen source with the concentration of 1%, 6 day's fermentation period. BoxuBehnken factorial design (BBD) and response surface methodology (RSM) were further used to optimize conditions for cellulase (Filter paper activity) production. The maximal cellulase (Filter paper activity) production (3.89 FPu/g) was obtained under the optimized conditions (ratio of water to material 2.38:1, initial pH 5.28, cultivation time 150.5 h). It was well corresponded to the calculated results (3.97 FPu/g) by model prediction [Chuannan Long, Yueqin Ou, Ping Guo, YuntaoLi, Jingjing Cui, Minnan Long and Zhong Hu^a (^aDepartment of Biology, Shantou University, 515063 Shantou, China), *Annals Microbiol*, 2009, **59**(3)].

NPARR 1(1), 2010-98, Efficiencies of NaOH production methods in a kraft pulp mill

There are several processes in a Kraft pulp mill where there is a need for sodium hydroxide, e.g. in the digester and the bleaching plant. The objective of this study is to perform a preliminary evaluation, intended to select the best alternative for producing sodium hydroxide on a Kraft pulp mill site. The first step of the evaluation consists of screening available processes for producing sodium hydroxide needed in the mill. The first step of the evaluation shows that the two best options for increasing the production of sodium hydroxide for internal use in a mill are the conventional lime cycle process or direct causticization with titanates. The second step of the evaluation compares the lime cycle and the titanate process using first and second law analyses to determine the energy requirement and the exergy efficiencies of both processes. Such analyses show a higher energy requirement and a lower exergy efficiency in the titanate process than in the lime cycle process without any heat integration. However, the titanate process shows better performance in terms of energy requirement and exergy efficiency than the lime cycle, if heat is integrated into both processes. The titanate process requires, in the best case, only 80% of the energy required for a fully heat-integrated lime cycle process [Tobias Richards^a, Carlos Pavletic and Johan Pettersson (^aDepartment of Chemical and Biological Engineering, Chalmers University of Technology, SE 412 96 Göteborg, Sweden), *Intern J Energy Res*, 2009, **33**(15), 1341-1351].

NPARR 1(1), 2010-99, Evaluation of a screening method for classifying virgin and recycled paper and board samples

This paper deals with the study of volatile compounds released by recycled paper and board. The aim of the study was to demonstrate the feasibility of headspace procedure coupled to gas chromatography/mass spectrometry (GC/MS) applied to complex paper-based samples together with a chemometric procedure as a powerful method for screening potential volatile contaminants released by the recycled and virgin paper samples. Using this procedure, the identification of virgin or recycled paper could be achieved based on the

identification on specific markers of the recycled pulp. Fifteen different samples within virgin and recycled paper were studied. After equilibration, the vapour phase of the samples was analysed by automatic headspace coupled online to GC/MS. The analytical approach for volatile compounds, their identification and the selection of some compounds as markers for recycled pulp are shown and discussed. A discriminate analysis applied to the set of results obtained allows classification of the samples into four different groups according to the content of recycled pulp (0, 10-30 and >80% of recycled pulp), the surface treatment of the paper (no surface treatment, clay coating and plastic coating), the grammage (from <100 to > 300g/m²) and the sample thickness (from <300 to >600µm). The matrix effect on the volatilization of some compounds from the paper samples and the analytical behaviour are also discussed [Esther Asensio and Cristina Nerín^a (^aAnalytical Chemistry Department, University of Zaragoza, CPS-Torres Quevedo Building, C/Maria de Luna 3, Zaragoza 50.018, Spain), *Pack Technol Sci*, 2009, **22**(6), 311-322]

SPICES/CONDIMENTS

NPARR 1(1), 2010-100, The potential of cinnamon to reduce blood glucose levels in patients with type 2 diabetes and insulin resistance-A Review

Cinnamon has a long history as an antidiabetic spice, but trials involving cinnamon supplementation have produced contrasting results. The aim of this review was to examine the results of randomized controlled clinical trials of cinnamon and evaluate the therapeutic potential amongst patients with diabetes and insulin-resistant patients, particularly the ability to reduce blood glucose levels and inhibit protein glycation.

A systematic electronic literature search using the medical subject headings 'cinnamon' and 'blood glucose' was carried out to include randomized, placebo-controlled *in vivo* clinical trials using *Cinnamomum verum* or *Cinnamomum cassia* conducted between January 2003 and July 2008.

Five type 2 diabetic and three non-diabetic studies (total N=311) were eligible. Two of the diabetic studies illustrated significant fasting blood glucose (FBG)

reductions of 18-29% and 10.3% ($p<0.05$), supported by one non-diabetic trial reporting an 8.4% FBG reduction ($p<0.01$) vs. placebo and another illustrating significant reductions in glucose response using oral glucose tolerance tests ($p<0.05$). Three diabetic studies reported no significant results. Whilst definitive conclusions cannot be drawn regarding the use of cinnamon as an antidiabetic therapy, it does possess antihyperglycaemic properties and potential to reduce postprandial blood glucose levels. Further research is required to confirm a possible correlation between baseline FBG and blood glucose reduction and to assess the potential to reduce pathogenic diabetic complications with cinnamon supplementation [S Kirkham, R Akilen, S Sharma and A Tsiami^a (^aFaculty of Health & Human Sciences, Thames Valley University, Brentford, TW8 9 GA, UK), *Diabetes, Obesity Metab*, 2009, **11**(12), 1100-1113].

NPARR 1(1), 2010-101, Antibacterial and antioxidant effects of five spice and herb extracts as natural preservatives of raw pork

The aim of this study was to find natural spice and herb extracts with antibacterial and antioxidant capacities that could be potentially used as natural preservatives in raw pork. The inhibitory effects of cinnamon stick, oregano, clove, pomegranate peel and grape seed extracts on *Listeria monocytogenes*, *Staphylococcus aureus* and *Salmonella enterica* were evaluated in raw pork at room temperature (20°C). The influences of these extracts on lipid oxidation in the meat were also investigated. The pH, colour parameters and TBARS (thiobarbituric acid-reactive substances) values were tested periodically. The results showed that all five natural extracts, especially clove, were effective against the bacteria. During storage the colour parameters of the extract-treated pork samples changed slightly, in comparison with significant changes in the control. Treatments with these extracts increased the stability of raw pork against lipid oxidation. Clove was the most effective for retarding lipid oxidation and presented the highest antioxidant activity in raw pork. This study suggests that the tested extracts, especially clove, have potential as natural preservatives to reduce numbers of pathogenic bacteria, colour degradation and lipid