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Research area: Product aims

Paper, paperboard and board // Packaging papers and paperboard

Key words:

Starch, surface application, arabinoxylan, film press, viscosity

TITLE:**Xylan containing starch formulations for the surface sizing of paper****Background/Problem area**

The surface application of starch is a well-established method for increasing paper strength. In surface sizing, a solution of degraded starch is applied to the paper by a size press or film press. The trend towards ever-faster, more powerful paper machines and the pressure to achieve energy savings explain why size presses have increasingly been replaced by film presses. The latter allow the application of starch solutions with high solid concentrations. However, starch application with high solid concentrations also means a high degradation of the starch solution in order to achieve a workable viscosity to allow penetration into the paper. High starch degradation in turn means a great loss of paper strength.

Joint analysis by TITK and UH showed a significant reduction in viscosity as a result of the addition of a small amount of arabinoxylan containing products to starch solutions without degradation the molar mass.

Objectives/Research results

The objective of the project is utilise materially unused arabinoxylan containing by-products of the starch process for viscosity reduction to enable surface sizing.

The cooperation partners are representatives of the starch industry, food industry, chemical industry, paper and corrugated board industry and mechanical and plant engineering sectors.

The aim of the research institutes is to systematically study the interactions between the addition of arabinoxylan to the starch solution and the reducing effect on viscosity and delayed retrogradation tendency. Based on these results, the best arabinoxylan containing starch formulation will be found, and the jet cooking process for starch degradation will be optimized for surface sizing. The studies included chemically modified xylan products (mainly cationically modified). It is expected that the use of cationically modified arabinoxylan products by recycling the surface sized papers will cause less starch to be replaced and hence lower chemical oxygen demand (COD) values of the waste water.

The xylans used show different effects on the viscosity of starch-xylan blends. The varying viscosity characteristics are caused by enzymes as contaminant in xylan. In the presence of xylan the enzymes are temperature stable to 120°C and pH-stable in a range of 5-9. The starch-xylan blends penetrate more deeply into the paper than conventionally degraded starch solutions. The conventionally degraded starch solutions show a higher tendency to retrogradation than the starch-xylan blends. Selected xylan samples are purified with proteases to determine further areas of application.

Application/Economic benefits

The benefits are:

- utilisation of material residues recovered from the starch process, which so far have only been used in limited amounts; market expansion through xylan containing starch products (starch industry, chemical industry, food industry)
- efficient starch surface sizing, reduction of COD by recycling the modified xylan containing sized papers (paper industry)
- opening-up new avenues of packaging design (corrugated board industry)
- industry access to the xylan extraction process; know-how expansion for quality assessment of starch solutions for the paper industry (mechanical and plant engineering)

Period of time: 01.04.2015 – 30.09.2017

Remarks

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