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Research area: Product aims

Paper, paperboard and board // Packaging papers and paperboard

Key words:

Reinforced starch, nano-fibrillar cellulose, NFC, synergy

TITLE:**Development of a starch cellulose composite for utilizing synergy effects in the papermaking process****Background/Problem area**

In paper production, starch is mainly used in surface sizing (87%) and in the wet-end. But the increase in paper properties evoked by starch is limited. The adsorption of wet end starch on pulp depends on many factors, especially the amount of dissolved salts and anionic trash in the circuit water and raw material. In addition, the process and the degree of substitution cause degradation of the starch molecules and, as a result, a reduction in strength properties. Native starch intended for surface sizing must be degraded to ensure that the starch solution has the proper viscosity for use in a size or film press. A decrease in molecular mass, however, always means a reduction in binding power.

The immense potential of nanofibrillated or nano-fibrillar cellulose (NFC) to improve the strength properties in paper is well known from the literature. But the application of NFC in pulp suspension brings about an immense rise in freeness. A suitable addition of cationic starch, among other things, can help to regulate this negative effect of the NFC. In addition, the conditions of the fibrils in nano-materials are important. NFC efficiency depends on the homogeneous distribution of the nano-fibrils by subjecting them to intensive shear stress to prevent their re-agglomeration. In-house studies conducted by PTS have also shown an increase in tensile strength in a pulp suspension with a large amount of fillers.

In light of these results, the question therefore arises: Is it possible to exploit the synergies of the two components through reinforcement of the starch using NFC? The synergies derive from the fact that on the one hand NFC increases the binding force of degraded starch and the other starch compensates for the strong freeness influence of NFC.

Objectives/Research results

The objectives of the project are to:

- Develop an innovative starch compound by reinforcing nanofibrillated cellulose for the production of graphic, packaging and specialty papers
- Reduce grammage with the same or better strength properties of papers by using reinforced starch

Currently research results are:

- To fabricate NFC products with different properties for Reinforcement
- To develop blending technologies to produce homogeneous starch NFC compounds
- Reinforced starch compensates the strong freeness influence of NFC

Application/Economic benefits

The applications of reinforced starch are seen in surface sizing and in the wet-end. The exploitation of the synergy effects of the two components starch and NFC as a composite is to achieve economy of a valuable fibrous raw material and to replace the raw material with fillers without any loss of strength properties.

Project period: 01.01.2011 – 31.12.2012

Remarks

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