VIPP VALUES CREATED IN FIBRE-BASED PROCESSES AND PRODUCTS

ASIF JAVED

LICENTIATE THESIS DECEMBER 17 2015

EFFECTS OF PLASTICIZING AND CROSSLINKING ON THE MECHANICAL AND BARRIER PROPERTIES OF COATINGS BASED ON BLENDS OF STARCH AND POLY(VINYL ALCOHOL)

BILLERUDKORSNÄS Knowledge Foundation

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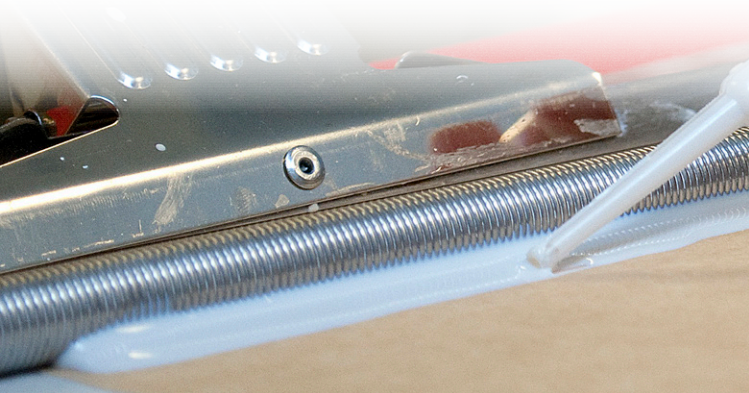
BIOGRAPHY

Asif Javed is doctoral candidate at Karlstad University, since 2012. His research focus is on mechanical and barrier properties of starch-based barrier coatings. Asif Javed obtained a Master of Science in Chemical Engineering from Karlstad University, Sweden in 2011. He has worked for a couple of years as an Assistant Engineer Production at Descon Chemicals Limited Lahore, Pakistan.



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ABSTRACT

Over the last few decades, industry and academia have made joint efforts to generate knowledge about renewable barrier materials in order to replace the oil-based barrier materials currently used in food packaging. This work has focused on the possibility of producing a material with high oxygen barrier properties including polyethylene as a moisture protection.

The flexibility of starch films was increased by adding poly(vinyl alcohol) (PVOH) to the starch and the addition of a plasticizer to the starch-PVOH blend films further increased the flexibility of the films. The plasticizers used were glycerol, polyethylene glycol and citric acid. Curing of the films reduced their flexibility. The addition of citric acid to a starch-PVOH blend increased the compatibility of the starch-PVOH blend and affected the barrier properties of the coating layers containing citric acid. When a sufficient number of coating layers were applied, the starch-PVOH-citric-acid coatings showed oxygen-transmission-rate-values similar to those of the pure PVOH and of the starch-PVOH blend without plasticizers.

Polyethylene extrusion coating on pre-coated paperboard resulted in a clear reduction in the oxygen transmission rate of all the pre-coating recipes based on starch-PVOH blends. The polyethylene extrusion coating showed a higher oxygen transmission rate for a board pre-coated with citric-acid-containing recipes than for a board pre-coated with polyethylene-glycol-containing recipes.

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LIST OF PUBLICATIONS

Publications Included in the Licentiate Thesis

I. Javed, A., Ullsten, H., Ernstsson, M., Järnström, L. Study of starch and starch-PVOH blends and effects of plasticizers on mechanical and barrier properties of coated paperboard
Submitted for publication

II. Javed, A., Ullsten, H., Järnström, L. Effects on oxygen-barrier properties of pre-treatment of paperboard with starch-poly(vinyl alcohol) blends before polyethylene-extrusion
Submitted for publication

Other publications

Javed, A., Ullsten, H., Järnström, L. (2015). Study of starch and starch-PVOH blends and effects of plasticizers on mechanical and barrier properties. FPIRC Summer Conference, August 2015, Grenoble, France

Javed, A., Ullsten, H., Järnström, L. (2015). Study of starch and starch-PVOH blends and effects of plasticizers on mechanical and barrier properties. Nordic Polymer Days, June 2015, Copenhagen, Denmark

Javed, A., Ullsten, H., Järnström, L. (2015). Study of starch and starch-PVOH blends and effects of plasticizers on mechanical and barrier properties. NT-FORSKNINGSKONFERENSEN, May 2015, Karlstad, Sweden

Javed, A., Ullsten, H., Järnström, L. (2015). Study of starch and starch-PVOH blends and effects of plasticizers on mechanical and barrier properties. Paper Surface Centre Seminar, March 2015, Karlstad, Sweden

Javed, A. (2012). Renewable packaging material. FPIRC Summer Conference, August 2012, Stockholm, Sweden

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VIPP stands for values created in fibre based processes and products and is a unique partnership in Swedish higher education. This is a long-term project financed by the Knowledge Foundation and the partner companies. The partnership was launched in 2011 and presently 18 doctoral students are busy with as many research projects. Three strong industrial graduate school environments:

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