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

CONTACT INFORMATION
Mail: asif.javed@kau.se
Tel: +46 723 21 11

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

LICENTIATE THESIS
DECEMBER 17 2015

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.

ISBN nr: 978-91-7063-673-8
Webb: http://urn.kb.se/resolve?urn=urn:nbn:se:kau:diva-38337
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


ABOUT KARLSTAD UNIVERSITY

As one of the youngest universities in Sweden, we hope to be more adventurous in challenging the established and exploring the unknown.

Our ambition is to contribute to the development of knowledge at international, regional and individual levels. Thanks to our openness, creativity and multidisciplinary, we have already attained a significant level of academic achievement. All our education and research is underpinned by a close dialogue with private companies and public organizations.

16 000 students and 1 200 employees make the University an inspiring place to work and study. We offer approximately 40 Bachelor’s degree programs, 30 Master’s level degree programs and 900 courses in the humanities and fine arts, social and economic sciences, natural sciences, engineering and technology, health care and teacher training.
VIPP INDUSTRIAL GRADUATE SCHOOL
A PARTNERSHIP OF 14 COMPANIES IN THE PAPER AND PULP INDUSTRY AND KARLSTAD UNIVERSITY

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:

• pulp, paper and graphic technology
• environment and energy
• service innovation and customer satisfaction

Here the disciplines of chemistry, chemical engineering, environmental and energy systems, physics, mechanical and materials engineering and the Service Research Center (CTF) at Karlstad University are collaborating.

The doctoral students share their time between Karlstad University and their respective company. Their academic supervisors and industrial mentors participate actively throughout the whole process.

BOARD
Louise Törnefalk Svanqvist, Resultat Effekt AB, Chair
Erik Sundström, SP Technical Research Institute of Sweden
Ivica Crnkovic, Mälardalen University
Niclas Andersson, BTG Instruments AB
Eva Söfting, BillerudKorsnäs AB
Patrik Larsson, Karlstad University
Thomas Nilsson, Karlstad University