

## Green coatings

### Background

Papers are coated in order to improve the properties of the surface and/or to include new functionalities like barriers for oxygen and/or water vapour. A coating formulation contains a high number of components, some of which are mineral based and others are manufactured from petroleum. Sustainability is one of the most important issues today and research aimed for new materials based on renewable sources to replace traditional oil-based products is important.

### Project description

This project aims to evaluate two new materials in paper coating. One is nanocellulose, a new nano-sized material that is processed from cellulose. Films made from this material have shown good oxygen barrier properties and high strength. Thus it is interesting to examine properties of coating layers containing this material in combination with minerals. The other material is bio-latex which is manufactured from renewable materials. These approaches will exclude or highly reduce petroleum based latex binder from the coating formulation. Both nanocellulose and bio-latex are fairly polar materials that will affect the surface chemistry of the final material. Thus, the project will include a comprehensive study on the surface chemistry and adhesion properties of the produced films.

Coating colours containing mineral pigments (e.g. calcium carbonate, kaolin clay, talk), thickener (e.g. carboxymethyl cellulose, polyvinyl alcohol) and nanocellulose and/or bio-latex and possibly also other components (e.g. water borne alkyds to control the water wettability) will be prepared. The colours will be characterized with respect to water retention and rheology.

Coating layers will be made from the colours prepared according to the paragraph above. A rod coating technique will be used. Tentative evaluations and characterizations of the coating layer are:

- Pore structure using mercury porosimetry,
- Surface energy using contact angle measurements,
- Absorption of water using MicroDAT, a technique that follow the absorption of micro drops,
- Strength using picking test or tensile strength test,
- Adhesion to polyolefines, e.g. polyethylene,
- Permeability of water vapour and oxygen.

The project will be concluded with an analysis on the possibilities to use nanocellulose and bio-latex in coating applications.

### Prerequisites

The candidate should preferably be a last-year student in suitable M.Sc. program in chemistry or chemical engineering.

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