Master thesis proposal

Production of oxidized cellulose at an industrial level: Towards improved properties of papers and boards

Background

Sodium periodate is a very good oxidizer for chemicals containing vicinal alcohols. The oxidation reaction with sodium periodate is a selective reaction that almost exclusively forms aldehydes (Figure 1). In the laboratory, periodate can be handled safely although it has high oxidation potential and is a quite harmful chemical. It has also been used in industrial processes to oxidize starch to dialdehyde starch.

Goal

Investigate the possibilities for producing large amounts (10 000 metric tons/year) of oxidized cellulose (dialdehyde cellulose) fibres and fibrils that can be utilized to introduce improved barrier properties and/or flexibility to paper and boards. Other possible applications will also be investigated.

Approach

The existing route with sodium periodate will be explored in more detailed regarding the utilization at industrial scale. It will include chemical- and waste handling, as well as a risk analysis (e.g., probability for explosion and fire). Furthermore, as all industrial processes are ranked on cost performance, this important matter will be part of the potential of a successful scale-up. The work will also include a literature study to explore how and if the oxidation can be optimized as well as performed by other (more industrially efficient) approaches. Promising alternatives might be studied in the laboratory.

Thesis work set-up

Supervision

The thesis worker will be located at Stora Enso Research Centre in Karlstad (RCK); optionally, the literature study can be partly performed at home university. The project start is as soon as possible. Examiner and main supervisor are appointed by BiMaC Innovation/KTH to take responsibility for the formal/academic procedures. Stora Enso appoints a deputy supervisor that takes responsibility for the experimental work and monitors Stora Enso’s interest.

Candidate requirements

The applicant is expected to be a master student with interest and qualifications in chemistry or chemical engineering. Please apply via Stora Enso’s webpage before the 6th of April 2014.

Remuneration

Remuneration is paid by Ljungbergsfonden according to the foundation’s guidelines (www.ljungbersfonden.se) after fulfilled work and examination.