

By means of a catalyst, cellulose can be bleached in seconds

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An Aalto University invention accelerates the bleaching process of cellulose pulps and reduces the quantity of chemicals needed therein.

The business enterprises that have supported the research are enthusiastic about the potential opened by this invention.

The production of cellulose has traditionally required a multi-staged [bleaching](#) process that has required a substantial number of chemicals. Now Aalto University's researchers have succeeded with the support of enterprises in the field to develop a catalytic bleaching method that significantly reduces the time taken by bleaching, not to mention the quantity of chemicals required.

'The catalyst we are using reacts with the bleaching agent and considerably intensifies its activity. If the reaction time of one stage has been about one hour up to now, with the same method the same result is achieved at best in less than one second. Traditionally, the number of stages has been 4–5; due to the catalyst, even two stages are enough,' sums up Professor of Wood Chemistry Tapani Vuorinen, who has headed up the research work.

Making factories smaller

The construction of a modern cellulose plant is a substantial investment, in part because of the demands set by the bleaching stage alone. The

capacity of a reactor required by one bleaching can be thousands of cubic metres, and each stage requires its own reactor. By using catalytic bleaching, it is possible to obtain the same final result with a lot less.

'At most one large reactor would be needed, and in other respects the bleaching reactors would fit into the space of an ordinary room,' Tapani Vuorinen believes.

In addition to the investment costs, utilization of catalytic bleaching would also reduce the factory's costs as a result of the reduction in the quantity of chemicals required. Tapani Vuorinen nevertheless reminds us that industrial utilization of the invention is still only at the visioning stage.

'We now have a working catalyst. Next we want to reduce its dosage further and improve its durability in the bleaching process,' he reveals.

The invention is so promising that each of the companies that got involved with it three years ago – Stora Enso, UPM, Metsä Fibre, Kemira and Andritz – see it as important to continue funding the research.

'Catalytic bleaching is an innovation which represents a new demonstration of the long-term work for bleaching development carried out at Aalto University. This effort has produced significant results which are utilized throughout the entire cellulose industry. Aalto University's bleaching research represents the peak in the field on the global scale. On its part, the continuous support from Tekes – the Finnish Funding Agency for Innovation has enabled both a high standard of research scientifically speaking and the development of new applicable bleaching technologies,' Kalle Ekman from Stora Enso and Janne Vehmaa from Andritz declare.

More information: "Rapid and Selective Catalytic Oxidation of Hexenuronic Acid and Lignin in Cellulosic Fibers." Naveen Kumar Chenna, Anna-Stiina Jääskeläinen, and Tapani Vuorinen. *Industrial & Engineering Chemistry Research* 2013 52 (50), 17744-17749. [DOI: 10.1021/ie4031924](https://doi.org/10.1021/ie4031924)

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