

## Optimized periodate oxidation of cellulose in resource-saving pathway

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The periodate oxidation is a suitable method to yield dialdehyde cellulose (DAC), a cellulose derivative that is increasing its role as a tunable material in a big range of application fields. The oxidation of cellulose by periodate ions is commonly a heterogeneous reaction that requires large consumption of water and energy for mixing and heating. We have studied ball milling of cellulose in the presence of periodate to overcome the issues of low kinetics and high diluted condition. In the literature, ball-milling was used to allow intimate and powerful mixing of cellulose together with the oxidizer, augmenting cellulose reactivity. In our approach, ball-milling of cellulose and reactants was less intensive and reaction took place during the so-called resting time, in which the reaction system equilibrates. The milling time, the resting time and the ratio of cellulose and oxidizer were optimized in an experimental design. Finally, the resulting model equation allows synthesis of dialdehyde cellulose with a tunable oxidation level in a highly resource efficient way.