

285. Exploring the potential of primary sludges from paper mills for the production of value-added compounds

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Background & Objectives: Industrial residues are emerging as low-cost alternatives to typical lignocellulosic materials, usually more expensive and hard to process, being currently the center of an urgent transition into a greener economy. One possible example are the primary sludges abundantly produced by paper mills, typically burned for heat generation. This work aimed to assess the potential of primary sludges to enzymatically produce monomer sugars that can be later converted into different compounds.

Methods: Pressed sludges from the primary treatment of effluents from a paper mill were provided by RAIZ (Aveiro, Portugal). These were subjected to a chemical treatment to remove a high content of calcium carbonate, allowing to concentrate their cellulosic fraction. This treated material was hydrolyzed using a commercial cocktail of cellulases (Cellic Ctec 2) at 50°C under different solids loadings and feeding regimes. The hydrolysis performance was evaluated from the levels of glucose released over time, quantified by HPLC.

Results: Initial compositional analysis of the primary sludges determined a rather modest cellulose content, around 30 %. Different neutralization processes were tested to remove the high content of carbonates, the best option allowing to concentrate cellulose fraction to 58 %. The neutralized solid was then tested for its hydrolysis susceptibility. A saccharification efficiency of 92 % was achieved in 140 h of a batch hydrolyses with 9 % solids. When superior solid loadings were employed, specifically 15 and 17.5 %, the saccharification efficiency slightly decreased to 90 and 87 %, respectively, still representing very interesting levels. For the 17.5 % suspension, a maximum of 102 g/L of glucose was obtained, which already represents an attractive level of glucose that can be further converted into a variety of compounds. Using an alternative strategy comprising a batch process (12.5 % solids) combined with multiple pulses of 2 % solid resulted in a slight reduction of the saccharification yield (82 %) but a 35 % reduction on enzymes consumption.

Conclusions: Primary sludges from paper mills are an interesting raw-material to produce several added-value compounds, relying on a sugar-rich and easy-to-process material. This can also represent a new and more attractive valorization route for this residue, representing an important economic gain for paper manufacturing sector.

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