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Removal of inhibitory compounds from olive stone auto-hydrolysis liquors by nanofiltration

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ABSTRACT

This work aims to study the use of nanofiltration for the removal of metabolic inhibitory compounds, such as furfural and acetic acid, from olive stones auto-hydrolysis liquors. The performance of NF90 and NF270 nanofiltration membranes was first assessed in terms of permeability and rejection to target compounds in a total recycle mode of operation. Both auto-hydrolysis liquors and model solutions, containing xylose, glucose and furfural, were processed at pressures ranging from 4 to 20 bar. Significantly lower membrane permeability was observed in the processing of the auto-hydrolysis liquors, which could be associated to membrane fouling. Solute rejection results for liquors and model solutions were similar, with an almost total rejection of hexoses and pentoses, while furfural and acetic acid were allowed to permeate to a certain extent. In order to accomplish an effective removal of furfural and acetic acid, the auto-hydrolysis liquors were processed in a diafiltration mode of operation, maintaining a constant volume. In this way, the concentration of hexoses and pentoses in the liquor was kept constant, while furfural and acetic acid were depleted to the desired values. A mathematical model based on a mass-balance of the system was validated with experimental data, which enables its use for process optimization and scale-up.

Keywords: Membrane processing; Nanofiltration; Diafiltration; Removal of metabolic inhibitors; Olive stone; Autohydrolysis

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