

Title: Cork industry wastewater partition by ultra/nanofiltration: A biodegradation and valorisation study

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Abstract: Wastewater from cork processing industry present high levels of organic and phenolic compounds, such as tannins, with a low biodegradability and a significant toxicity. These compounds are not readily removed by conventional municipal wastewater treatment, which is largely based on primary sedimentation followed by biological treatment. The purpose of this work is to study the biodegradability of different cork wastewater fractions, obtained through membrane separation, in order to assess its potential for biological treatment and having in view its valorisation through tannins recovery, which could be applied in other industries. Various ultrafiltration and nanofiltration membranes were used, with molecular weight cut-offs (MWCO) ranging from 0.125 to 91 kDa. The wastewater and the different permeated fractions were analyzed in terms of Total Organic Carbon (TOC), Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Total Phenols (TP), Tannins, Color, pH and Conductivity. Results for the wastewater shown that it is characterized by a high organic content (670.5-1056.8 mg TOC/L, 2285-2604 mg COD/L, 1000-1225 mg BOD/L), a relatively low biodegradability (0.35-0.38 for BODs/COD and 0.44-0.47 for BOD20/COD) and a high content of phenols (360-410 mg tannic acid/L) and tannins (250-270 mg tannic acid/L). The results for the wastewater fractions shown a general decrease on the pollutant content of permeates, and an increase of its biodegradability, with the decrease of the membrane MWCO applied. Particularly, the permeated fraction from the membrane MWCO of 3.8 kDa, presented a favourable index of biodegradability (0.8) and a minimized phenols toxicity that enables it to undergo a biological treatment and so, to be treated in a municipal wastewater treatment plant. Also, within the perspective of valorisation, the rejected fraction obtained through this membrane MWCO may have a significant potential for tannins recovery. Permeated fractions from membranes with MWCO lower than 3.8 kDa, presented a particularly significant decline of organic matter and phenols, enabling this permeates to be reused in the cork processing and so, representing an interesting perspective of zero discharge for the cork industry, with evident environmental and economic advantages. (C) 2010 Elsevier Ltd. All rights reserved.

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