ABSTRACT

Effluents from biorefineries are highly coloured and carry a large organic load. Traditional treatment options, such as anaerobic and aerobic digestions are capable of reducing the biological oxygen demand, but cannot remove the residual chemical oxygen demand (COD) nor decolourise the effluent. Membrane filtration has been increasingly used for water recovery from industrial effluents, such as from these biorefineries. Different grades of membranes can be used to remove particular contaminants, such as suspended solids, organic macromolecules and salts from these effluents. Effluents were filtered by ultrafiltration (UF) and nanofiltration (NF) membranes and samples were analysed for traditional parameters, such as COD, dissolved organic carbon (DOC) and colour. While UF was capable of only partial removal of colour, COD and DOC, NF was shown to be capable of removing close to 100% of the organic content of the molasses and lignocellulosic effluents. Use of advanced analytical techniques, such as fluorescence excitation emission matrix analysis and liquid chromatography, helped to illustrate the difference between organic compounds found within molasses and lignocellulosic effluents. This was also useful in explaining the difference in membrane separation performance between the two effluents.

Keywords: Membrane filtration; Biorefinery wastewater; Membrane fouling; Foulant characterisation; Industrial wastewater treatment

1. Introduction

The use of molasses in the fermentation industry is associated with the generation of large volumes of effluent containing high concentrations of coloured compounds, such as melanoidins. This is a widely known industrial problem and hence a lot of research has been conducted on decolourisation and chemical oxygen demand (COD) removal from molasses wastewater [1–3]. This includes the use of biological treatment, oxidation, evaporation and coagulation amongst others. There has also been extensive research into the use of membranes in treating molasses effluents [4–6]. While there has been extensive progress in researching the treatment options for such effluent streams, analysis of these effluents rarely con...