

Hydrophobic membranes for salts recovery from desalination plants

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Received 3 June 2009; Accepted 18 December 2009

ABSTRACT

Membrane crystallization (MCr) can be used to process highly concentrated aqueous solutions. In MCr, membrane distillation is used to recover water and to generate the desired supersaturation in a crystallizer tank where crystals can be precipitated. In this paper the stability and control of MCr process has been investigated. The experimental tests have been carried out on streams representing nanofiltration and reverse osmosis retentate streams of the desalination plants. The deposition and accumulation of crystals on membrane surface and inside the membrane module has been prevented by recovering the produced crystals and by controlling the temperature of the solution flowing along the membrane module. The obtained almost constant trend of the trans-membrane flux has been the demonstration of the good carried out operations. The produced particles have been characterized in terms of shape, dimension, crystal size distribution (CSD), coefficient of variation (CV) and growth rate. The obtained CVs are lower than those from conventional equipments. Therefore, they are characteristic of narrow CSD and of qualitatively better products. Moreover, the experimentally determined crystals growth rate has allowed (i) to study the fluid-dynamic effect on MCr operation, (ii) to determine the crystals growth control based mechanism and (iii) to show that the presence of ions accelerates kinetic rate of NaCl crystallization while the presence of humic acid (the main component of the natural organic matter contained in waters) inhibits crystals growth rate.

Keywords: Crystals characterization; Crystals recovery; Membrane crystallizer

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