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Development of a polyvinylidene difluoride membrane for nanofiltration

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Abstract

Integrally skinned asymmetric nanofiltration (NF) membranes are widely used for treating a variety of aqueous and solvent streams. Polyvinylidene difluoride (PVDF), is an excellent film forming polymer with outstanding chemical, thermal and mechanical stability. However, additive-free PVDF membranes with pores small enough to apply them in NF do not currently exist. By accurately tuning the phase inversion parameters (i.e. polymer concentration, co-solvent concentration and evaporation time), a membrane was obtained that retains for 80% a 327 Da solute from an aqueous solution at a permeance of 1.8 LMH/bar when operated at 10 bar. The membranes were characterised by XRD and SEM, while the membrane formation process was characterised using viscosity measurements and cloud point determinations.

Keywords: polyvinylidene difluoride; nanofiltration; flat sheet; phase inversion.

1. Introduction

Polymeric nanofiltration (NF) membranes can be prepared either as thin film composite or integrally skinned asymmetric membranes. For both types of membranes, a wide range of polymers have been thoroughly studied. Compared to inorganic NF membranes which are usually more stable, polymeric NF membranes have the advantages of being relatively cheap and easier to produce and upscale. Disadvantages are their limited thermal and chemical stability which results in a shorter lifetime and diminishing performances over time [1,2].

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