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# Ultrasonic-assisted fabrication of high flux T-type zeolite membranes on alumina hollow fibers

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## ABSTRACT

Ultrasonic-assisted pretreatment prior to hydrothermal synthesis is employed for the first time in the preparation of T-type zeolite membranes on  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> hollow fibers by secondary growth. The synthesis time can be shortened from 40 h to 24 h with only 0.5 h ultrasonic pretreatment of the synthesis solution. Elongating ultrasonic treatment time to 1.0 h has no further improvement for the formation of dense membrane. Typically, the pure phase T-type zeolite membrane synthesized in 24 h with 0.5 h ultrasonic pretreatment has a separation factor of >10000 and a flux of 12.2 kg m<sup>-2</sup> h<sup>-1</sup> for 90.0 wt% isopropanol aqueous solution at 75 °C. When the porosity of the hollow fiber support is 68%, the flux is as high as 14.3 kg m<sup>-2</sup> h<sup>-1</sup>, which is the highest flux ever reported. The high flux of the membrane can be mainly ascribed to the special structure and porosity of the  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> hollow fiber support. Finally, a mechanism for ultrasonic-assisted membrane preparation is proposed.

**KEYWORDS:** Alumina hollow fiber; T-type zeolite membrane; Ultrasonic-assisted pretreatment; Pervaporation; Dehydration

## 1. Introduction

The purification of ethanol and isopropanol aqueous solutions is of great

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