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www.elsevier.com/locate/memsci

PII: S0376-7388(16)30939-5
DOI: http://dx.doi.org/10.1016/j.memsci.2016.07.023
Reference: MEMSCI14608

To appear in: *Journal of Membrane Science*

Received date: 28 February 2016
Revised date: 5 June 2016
Accepted date: 9 July 2016

Cite this article as: Kang Guan, Wu Qin, Yang Liu, Xiaoqin Yin, Cheng Peng, Ming Lv, Qian Sun and Jianqing Wu, Evolution of porosity, pore size and permeate flux of ceramic membranes during sintering process, *Journal of Membrane Science,* http://dx.doi.org/10.1016/j.memsci.2016.07.023

Evolution of porosity, pore size and permeate flux of ceramic membranes during sintering process

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Abstract

Because of the complex sintering kinetics it has been a continual challenge to link the sintering process of ceramic membranes to its permeable and retention properties. The present work presents a numerical model based on the realistic sintering kinetic law to study the dependence of the porosity, pore size and permeate flux of α-alumina membranes on the sintering process. Our emphasis is the effects of initial porosity and particle size distribution on the final performance of the membranes after sintering. Our results indicate that the pore size and permeate flux are mainly controlled by the initial porosity and the departure of the particle size distribution from the mean particle size. The evolution of the porosity, pore size and permeate flux over a range of particle size, dwelling time and temperature can be collapsed to a general curve by adapting a scaling time. The simulation results are validated by comparing to previously published experimental data.

Keywords: Ceramic membrane; Porosity; Pore size; Permeate flux; Sinter