# Efficient estimation of crystal filterability using the discrete element method and the Kozeny-Carman equation

Ming-Chun Fanga, Psalm Josiah Tana, Jeffrey D. Warda[[1]](#footnote-1)

a Department of Chemical Engineering, National Taiwan University, Taipei 10617, Taiwan

# Abstract

A new method is proposed for efficiently predicting filter cake resistance as a function of crystal size distribution, which is useful for the preliminary design of processes where an economic tradeoff is encountered between a crystallization step and a filtration step. In that case it is necessary to estimate the filter cake resistance repeatedly as a function of crystal size distribution for the process design and optimization. The proposed method is validated using published experimental data and illustrated using an integrated crystallization-filtration process of ammonium alum. The results show that for a crystalline product with relatively large crystal size, the overall filter resistance depends strongly on the filter medium resistance. In this case, a decrease in filter cake resistance may have limited effect on the process economics. However, for a crystalline product with a small crystal size, the trade-off between crystallizer design and filter design will become an important issue.

**Keywords:** Pressure filtration, Crystal size distribution, Cake resistance, Discrete Element Method, Simulation

1. E-mail: jeffward@ntu.edu.tw [↑](#footnote-ref-1)