Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

The permeability of poly-disperse porous media and effective particle size B.I. MARKICEVIC, C. PRESTON, Pall Corp., S. OSTERROTH, O. ILIEV, Fraunhofer ITWM and University of Kaiserslautern, M. HURWITZ, Cornell University — The interactions between the fluid and solid phases in porous media account for the openness and length of the flow path that the fluid needs to travel within. The same reasoning applies for both mono- and poly-disperse media, and is reflected in the adoption of the same permeability models. The only difference is that an effective particle size diameter has to be used for the poly-disperse samples. A filtration experiment is used to form a particle layer, filter cake, consisting of particles of different sizes. Both inflow and outflow particle size distribution are measured by particle counting method, and from their difference, the particle size distribution in the cake is determined. In a set of experiments, the filtration history is altered by changing (i) filtration medium; (ii) suspension flow rate; and (iii) particle concentration, where in all cases investigated the cake permeability remains constant. In order to predict the permeability of poly-disperse cake from the analytical models, the particle size distribution moments are calculated, and the permeability is found for each moment. Comparing the experimental to the analytical permeability values the effective particle size is found, where the permeability calculated by using the harmonic mean of the particle size distribution reproduces the permeability experimental value best. Finally, in the parametric study, reducing the cake porosity and/or lowering the particle retention shifts effective particle size used in the permeability model toward higher moments of the particle size distribution function.

B. I. Markicevic
Pall Corp.

Date submitted: 10 Jul 2015 Electronic form version 1.4