

Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Plugging of microchannels by spherical particles¹ ERIC CLIMENT, Institut de Mecanique des Fluides de Toulouse, CONSTANT AGBANGLA, PATRICE BACCHIN, Laboratoire de Genie Chimique, UNIVERSITY OF TOULOUSE COLLABORATION, FEDERATION DE RECHERCHE CNRS - FERMAT COLLABORATION — We investigate by means of numerical simulations the dynamic formation of 3D structures of microparticle aggregates blocking the flow through microchannels. Both the geometries of a straight channel and a sudden reduction of section are analyzed. We use the Force Coupling Method (Climent & Maxey, 2010) to handle simultaneously multi-body hydrodynamic interactions of a confined flowing suspension together with particle/particle and particle/wall surface interactions leading to the adhesion and aggregation of particles. The basic idea of the Force Coupling Method relies on multipole expansion of velocity perturbations induced by the presence of particles in the flow. Simulation results show that varying the magnitude of DLVO interparticle and particle/wall interactions leads to distinct scenarios of pores clogging. We investigate the kinetics of the microchannel occlusion (corresponding to a temporal decrease of the bulk permeability of the channel). We identify the nature of the fouling mechanism: deposition, interception, bridging ... (see the papers of Sharp & Adrian (2005), Ramachandran & Fogler (1999) and Marshal, 2007).

¹We acknowledge the support of the research federation FERMAT.

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Date submitted: 27 Jul 2010

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