

Selection of Flow Aids: Model-based Prediction of Flow Properties Enhancements

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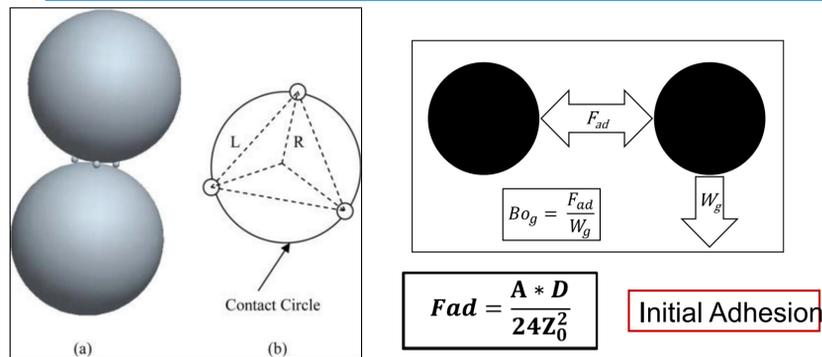


Objective: Mechanistic prediction of flow properties and its enhancements from particle scale measures, developing a collection of models and decision tools that can be used for flow aid selection while minimizing the extent of experiments needed.

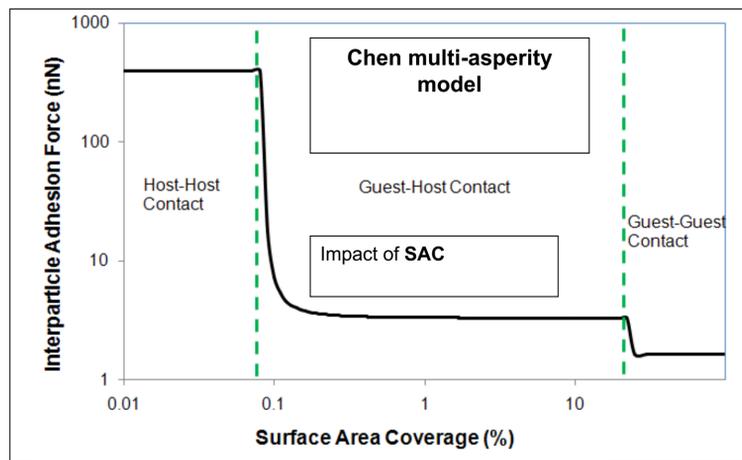
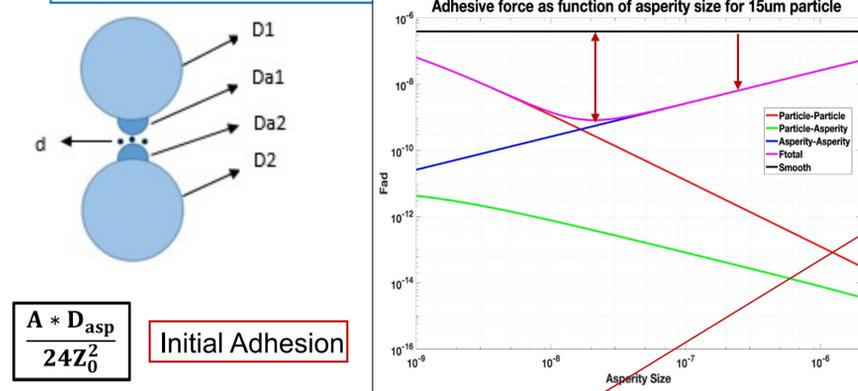
Recent Results: Review of existing particle adhesion models led to identification and addressing of main deficiencies, e.g., the effects of the particle surface roughness and the influence of nano-silica agglomeration. Key bulk properties of dozens of industry relevant fine powders were used to test applicability of the multi-asperity model with/without dry coating with varied amounts of hydrophobic or hydrophilic silica. Powder agglomeration identified as an indicator of powder flowability and dissolution.

Multi-asperity Contact Models for Smooth and Rough Particles Accounting for Nano-coating

Smooth Particle with dry coated nano particle



Rough Particle with dry coated nano particle

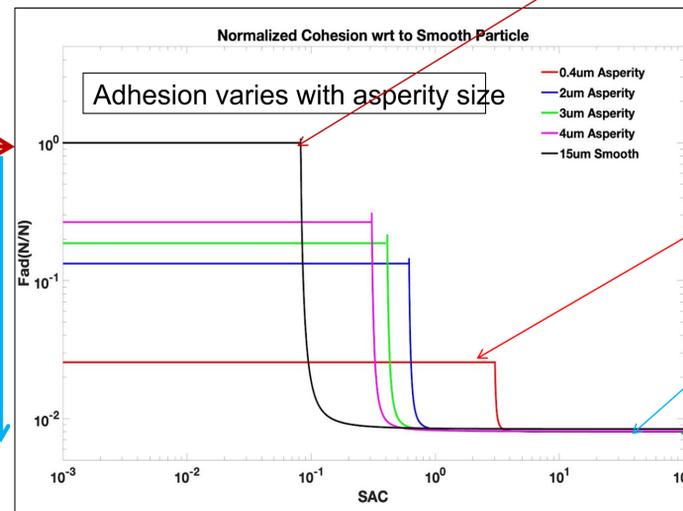


$$F_{ad} = \frac{Ad}{8z_0^2} + \frac{AD}{24(2d + z_0)^2}$$

Nano silica size

Particle Size

Adhesion after dry coating

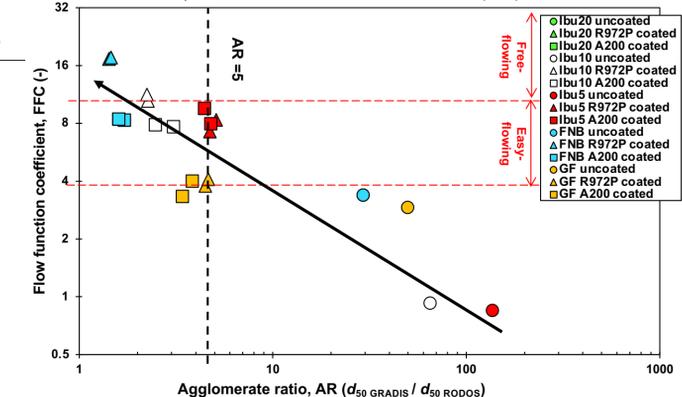
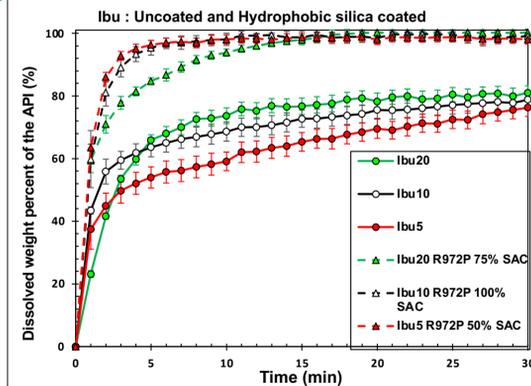
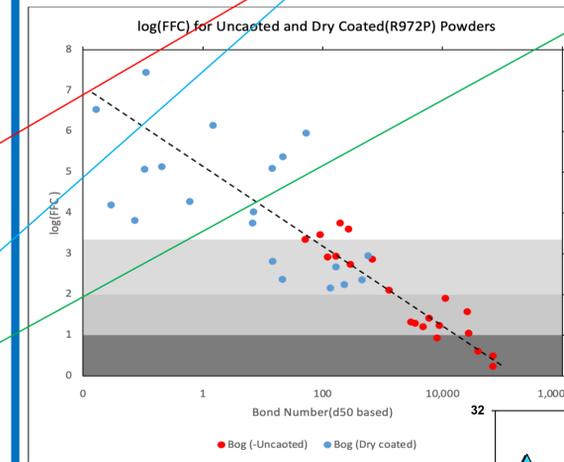
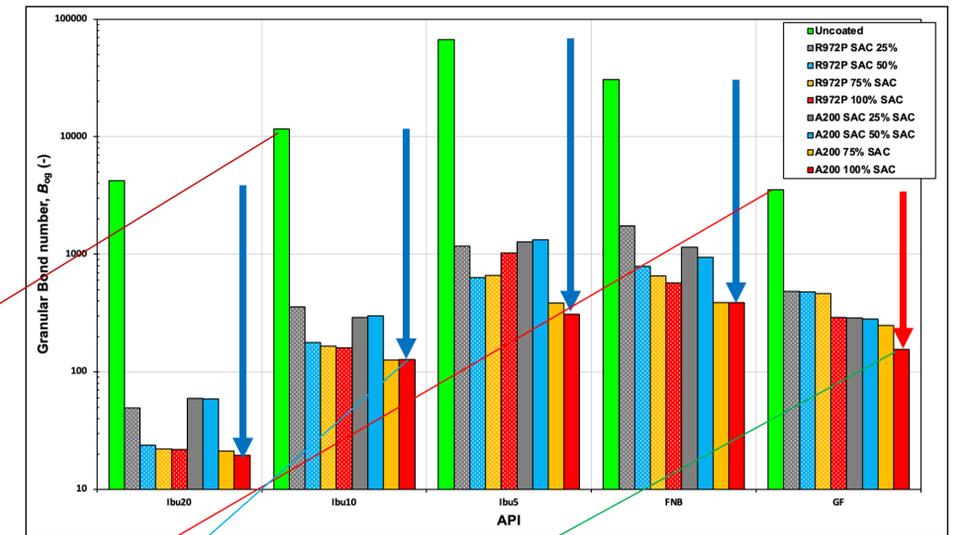


Nano Silica Size

Particle Asperity Size

Adhesion after dry coating

Bond numbers smooth & rough particles



Member input and collaborations welcome!