Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Dissolution of a Colloidal Particle in an Oscillatory Fluid Medium

DEZHUANG YE, JI-QIN LI, Mechanical Engineering, University of Connecticut, ROBIN BOGNER, Pharmaceutical Sciences, University of Connecticut, TAI-HSI FAN, Mechanical Engineering, University of Connecticut — Understanding dissolution kinetics of a colloidal particle in an aqueous solution is of great importance in many pharmaceutical and biochemical applications. We present theoretical analysis of low Reynolds number transient dynamics and mass transfer of a dissolving spherical particle in a unidirectional oscillatory flow. The coupling of fluid flow and passive motion of the particle are resolved analytically, and the transient mass transfer associated with the oscillation of the particle is numerically computed. The flow patterns, diffusive and convective transport phenomena, and the dissolution kinetics under various saturation concentrations and flow conditions are characterized by the frequency parameter, Schmidt number, and Peclet number. The result severs as a basic case in determining the efficiency of drug dissolution or reconstitution that depends on various shaking methods.

Tai-Hsi Fan
University of Connecticut

Date submitted: 06 Nov 2015 Electronic form version 1.4