The Effect of Serum Proteins and Hydrophilic Polymers on the Transport of Model Lung Surfactant

Patrick C. Stenger, Jonathan G. Fernsler and Joseph A. Zasadzinski
Chemical Engineering Department, University of California at Santa Barbara

Inactivation of model lung surfactant (LS) by serum proteins and subsequent inactivation reversal by hydrophilic polymers is investigated with a Langmuir trough and quantitative Brewster angle microscopy. These experiments are compared with a novel LS transport theory based on slow flocculation of colloidal particles with a potential energy barrier. While the serum proteins increase the energy barrier due to steric and electrostatic effects, the polymers generate a depletion potential to reduce the energy barrier. An experimental determination of the optimum polymer concentration for inhibition reversal demonstrates the need to consider both the scaling of depletion forces and the polymer overlap concentration. This work has applications in developing a next-generation, inactivation-resistant LS which will serve as therapy for lung diseases such as Acute Respiratory Distress Syndrome and asthma.