

Effect of Liquid Property on the Filter Loading Characteristics of Liquid-coated Particles

Ta-Chih Hsiao and Da-Ren Chen

Department of Energy, Environmental and Chemical Engineering
Washington University in St. Louis
MO 63130, St Louis, USA

ABSTRACT

Extensive studies have been conducted to investigate the behavior of filters when loaded with solid and liquid particles. In the real-world applications particles are often liquid-coated, so called oily particles or dusty oils. The objective of this study is to investigate the filter loading characteristics of liquid-coated particles for low-performance filter media. In the experiment the co-solvent method was used to prepare liquid mixtures for the generation of test particles by an ultrasonic generator. Four different coating liquids, including DOS, light mineral oil, castor oil and glycerol, were tested. The surface tension of liquids is varying from 30 to 65 mN/m and the viscosity is ranging from 26 to 2100 mPa/s. The overall particle size was kept round 2.5 micrometer and the filter face velocity fixed at 11 cm/s. Generated particles were loaded on two low-performance filter media, made of cellulose and glass fibers, to study the filter behaviors under the liquid-coated particle loading.

The result shows in general the loading behavior of liquid-coated particle transits from that of loading solid-only particle to that of loading liquid-only particles as the percentage of liquid volume in particles increases. However, the transition between two limiting cases (i.e., solid-only and liquid-only cases) is different for different coating liquids. It is also found that small percentage of solid mass in liquid-coated particles could dramatically change the loading behavior. The detail of experimental results will be presented in the conference.