Lung-Deposition of Highly Agglomerated Nanoparticles

Supporting/Contributing Agency: U.S. EPA and NSF (Grant No. BES-0646507)

Annual sales of commodities that incorporate highly agglomerated nanoparticles (e.g., silica, titania, carbon black, etc.) exceed $15 billion. These agglomerates are often produced by the oxidation of gas phase precursors, so some human exposure is inevitable. The deposition of such agglomerates in the lung has not been systematically investigated. In collaboration with Prof. Sotiris Pratsinis (ETH Zürich), Mr. Jacob Scheckman and Prof. Peter McMurry have developed methods to produce agglomerates in a highly reproducible manner. They have also developed an *in situ* technique that enables very accurate measurements of their fractal dimensions (Df) and dynamic shape factors (χ) (Scheckman, Pratsinis, and McMurry, 2009; Park et al. 2008; figure 1.2). As shown in the Figure, compact agglomerates have large fractal dimensions (~2.4), whereas more open structures have smaller values (~1.7). Preliminary measurements of deposition efficiencies in lung models show that deposition efficiencies of fractals exceed those for spheres of the same mobility size.

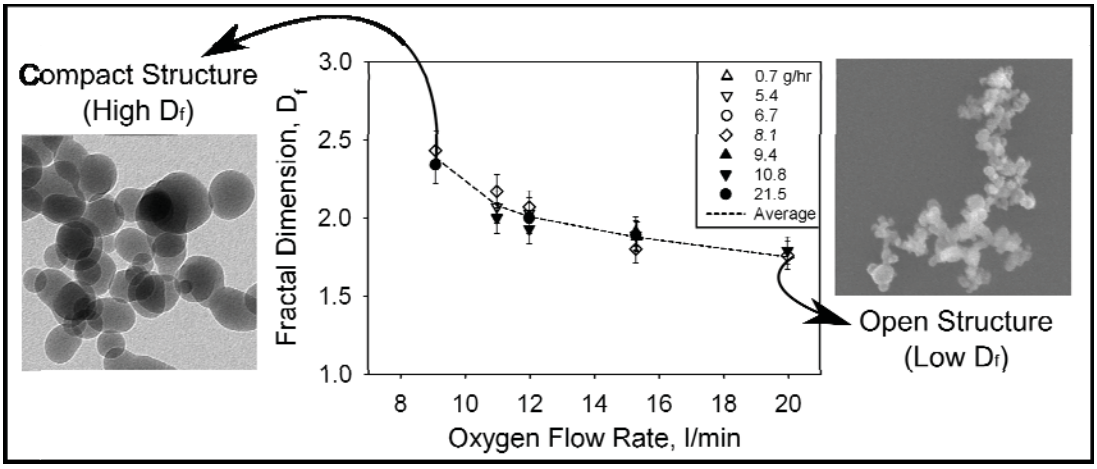

Figure. *Caption*.

References/Publications

Park, K., D. Dutcher, M. Emery, J. Pagels, H. Sakurai, J. Scheckman, S. Qian, M.R. Stolzenburg, X. Wang, J.Yang, and P.H. McMurry. 2008. Tandem measurements of aerosol properties - A review of mobility techniques with extensions. *Aerosol Sci. Technol*. 42:801-816.

Scheckman, H, S.E. Pratsinis, P.H. McMurry. 2009 (submitted). Rapid characterization of agglomerate aerosols by in situ mass-mobility measurements. *Langmuir*.