Ultra Low Density Materials Synthesized via an Aerosol Gelation Process  

RAJAN DHAUBHADEL, AMITABHA CHAKRABARTI, CHRISTOPHER M. SORENSEN, Kansas State University — We synthesized carbon and silica ultra low dense and high specific surface area solids via aggregation and gelation of nano-sized particles in the aerosol phase. We named such solids as Aerosol Gels. The process of formation of an Aerosol Gel starts with a collection of individual nano-sized monomers which undergo Brownian aggregation and finally gel quickly relatively to the gravitational settling when the monomers are small enough ($\sim 10$ nm radius) and the monomer volume fraction is high enough ($\geq 10^{-4}$). The Carbon Aerosol Gel was found to have high specific surface area ($200 - 350$ m$^2$/g), an extremely low density ($2.5 - 5$ mg/cc) and a high electrical conductivity, properties similar to conventional aerogels. The Silica Aerosol Gel was also extremely porous with high specific surface area ($\sim 450$ m$^2$/g) and a very low density ($\sim 4$mg/cc).