Structure of Gelling Silica Under Shear: a USANS and SANS Study

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Some time ago we carried out a Small Angle Neutron Scattering (SANS) investigation on the nanometer length scale structure of gelling colloidal silica particles of diameter ~7 nm. Of interest were the results obtained when the gelling system was subjected to an external shear, particularly the relationship between the system's structure and the viscosity as a function of the gelation time. The exploratory range of that study has recently been extended to include the micrometer length scale. Data using the Ultra Small Angle Scattering (USANS) spectrometer at The Australian Nuclear Science and Technology Organisation (ANSTO) facility, along with companion SANS experiments, are reviewed. Key data are the scattered intensity and structure factor of the gelling silica system as a function of time after gel initiation, and when the system is at a steady state. The focus of this paper is a discussion on fitting both the SANS and USANS data with a consistent model. The predictive capability of the model is outlined.