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Colloidal jamming in nano-confinements observed with SESANS¹ RANA ASHKAR, University of Maryland at College Park/NIST Center of Neutron Research, ROGER PYNN, Indiana University Bloomington/ Oak Ridge National Laboratory — The behavior of matter in nano-confinements is being investigated as a means for obtaining controlled highly-ordered nanomaterials. To understand this behavior a 3D structural characterization of the confined matter is necessary. Nondestructive probing of such samples challenges conventional microscopy techniques. On the other hand, the submicron size of a single confinement is impractical for neutron and x-ray scattering experiments but this dilemma can be overcome by using a confining matrix made up of an array of identical confinements, e.g. the grooves of a diffraction grating. The caveat is that the periodicity of the sample amplifies dynamical scattering effects that are not accounted for in approximate scattering theories and a full dynamical theory (DT) calculation becomes unavoidable. Dynamical theory calculations, applied to neutron spin-echo small angle scattering (SESANS) measurements on nanostructured gratings, give good account of all the data sets we collected so far in reflection and transmission scattering geometries. Calculations on recent measurements performed on a silica suspension in contact with the grooves of a diffraction grating show colloidal jamming in the grooves.

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