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Self-Healing Colloidal Crystals: Why Soft Particles Feel the Squeeze ANDREA SCOTTI, URS GASSER, LNS, Paul Scherrer Institut, EMILY HERMAN, Ultraink Inc., MIGUEL PELAEZ-FERNANDEZ, School of Physics, Georgia Institute of Technology, L. ANDREW LYON, Schmid College of Science and Technology, ALBERTO FERNANDEZ-NIEVES, School of Physics, Georgia Institute of Technology — Point defects in crystalline materials disturb the crystal structure and often prevent crystallization. In particular, this is the case for too big particles that are put into a crystal. In metal melts, a size mismatch of 15% of the atoms in the melt suppresses crystallization. Furthermore, hard spheres with a polydispersity greater than 12% do not form crystals, and the polydispersity in the crystal state does not exceed 5.7%, as local segregation occurs. These restrictions do not necessarily apply for soft microgels. Lyon et al. (A. St. J. Iyer and L. A. Lyon, *Angew. Chem. Int. Ed.*, 48, 2009) find bigger microgels to shrink and fit into the lattice formed by smaller ones. We find that charged groups in the microgel and their counter-ions are the key to explain this remarkable spontaneous deswelling of microgels. Using small-angle neutron and X-ray scattering, we directly observe the deswelling of bigger particles with increasing volume fraction and the effect of the bigger particles on the phase behavior of the suspension. Furthermore, we determine the osmotic pressure using osmometry and present a model for the selective deswelling of the big particles.

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