The liquid-crystal phase transition in suspensions of soft particles
MIGUEL PELAEZ-FERNANDEZ, ANTON SOUSLOV, School of Physics, Georgia Institute of Technology, L. ANDREW LYON, School of Chemistry & Biochemistry and the Petit Institute for Bioengineering & Bioscience, Georgia Institute of Technology, PAUL M. GOLDBART, ALBERTO FERNANDEZ-NIEVES, School of Physics, Georgia Institute of Technology — We experimentally determine the equation of state of swollen microgel suspensions: \( \pi = \pi(\zeta, N_c) \), with \( \pi \) the suspension osmotic pressure, \( \zeta \) the generalized volume fraction and \( N_c \) the number of chains per particle, which determines the microgel stiffness. We find that the melting and freezing lines shift to higher \( \zeta \) as the particle becomes softer. Concomitantly, the liquid-crystal coexistence region becomes wider. We suggest that this behavior is due to the internal degrees of freedom of the microgel particles, which increase as the particle becomes softer. In this case, crystallization requires freezing some of these additional degrees of freedom resulting in the observed widening of the coexistence region. Our experiments provide the starting point to understand how the single-particle elasticity affects the phase behavior of colloidal suspensions.