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Yielding in a strongly aggregated colloidal gel: 2D simulations and theory SAIKAT ROY, MAHESH TIRUMKUDULU, Department of Chemical Engineering, Indian Institute of Technology Bombay, Powai, Mumbai - 400076. India — We investigated the micro-structural details and the mechanical response under uniaxial compression of the strongly aggregating gel starting from low to high packing fraction.The numerical simulations account for short-range inter-particle attractions, normal and tangential deformation at particle contacts,sliding and rolling friction, and preparation history. It is observed that in the absence of rolling resistance(RR),the average coordination number varies only slightly with compaction whereas it is significant in the presence of RR. The particle contact distribution is isotropic throughout the consolidation process. In both cases, the yield strain is constant with the volume fraction. The modulus values are very similar at different attraction, and with and without RR implying that the elastic modulus does not scale with attraction.The modulus was found to be a weak function of the preparation history. The increase in yield stress with volume fraction is a consequence of the increased elastic modulus of the network. However, the yield stress scales similarly both with and without RR. The power law exponent of 5.4 is in good agreement with previous simulation results. A micromechanical theory is also proposed to describe the stress versus strain relation for the gelled network.

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