Abstract Submitted
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Does Carbopol Elasticity affect its Yielding Dynamics? A study based on the Settling of a Particle in "Plastic" materials[1] DIMITRIS FRAGGEDAKIS, YIANNIS DIMAKOPOULOS, JOHN TSAMOPOULOS, Univ of Patras — For several decades, Carbopol is assumed to be the ideal plastic material, exhibiting only yield phenomena without viscoelastic effects in yielded regions. Recently, it has been shown that when stresses do not overcome the yield criterion, it behaves as an ideal Hookean solid, Piau (2007). Also, experiments (Putz et al. (2006); Holenberg et al. (2012)) reveal phenomena which can be attributed only to elastic properties of the fluidized region, such as the appearance of the so-called "negative wake," Harlen (2002), downstream the sphere and the loss of fore-aft symmetry of the yield surface around a sedimenting particle. Our study is based on the sedimentation of a confined particle in materials which exhibit elastoviscoplastic behavior and proves that Carbopol cannot be considered as the ideal plastic material anymore. Moreover, when elasticity comes into play, the derived stoppage criterion for a sedimenting sphere by Beris et al. (1985) and experimentally confirmed by Tabuteau et al. (2007) is not satisfied, as a complex stress field is developed around the particle and fluidization near the rigid surface is favored. The existence of the yield surface near the sphere enhances the formation of shear layers, which are responsible for the formation of the negative wake, irrespectively of the position of the confinement in relation to the sphere.

[1]GSRT Greece-Israel bilateral projects PHARMAMUDS #3163.

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