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Sedimentation of solid spheres and Newtonian drops in a viscoplastic medium OLGA LAVRENTEVA, YULIA HOLENBERG, Chemical Engineering Dept., Technion, URI SHAVIT, Envinromental, Water and Agricultural Engineering Dept., Technion, AVINOAM NIR, Chemical Engineering Dept., Technion — The slow sedimentation of smooth and rough solid spheres and Newtonian drops in viscoplastic fluid (low concentrated, of 0.07% w/w, aqueous gel of Carbopol 940) is studied experimentally. It was found that when the drops settle in proximity to a vertical solid wall their settling speed is augmented and drops drift slowly toward the wall. This is contrary to what is known with Newtonian or viscoelastic domains. The shape of yielded regions around the particles and the flow field within these regions were determined making use of PTV and PIV methods. It is observed that yielded region around slowly moving rough sphere is almost fore-and-aft symmetric and resembles that obtained via numerical modeling. In contrast to this, yielded regions around drops and smooth particles are not symmetric. A striking similarity between flow fields generated by the motion of the later two types of inclusions was observed. This phenomenon as well as the increase of settling speed in the vicinity of walls can be attributed to the dynamic formation of a thin clear layer providing effective slip at the interface of smooth particles or at the wall. The existence of the wall slip was demonstrated also in our studies of Carbopol gel rheology.

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