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Classical 2d dynamics simulations of metallic spheres in highly viscous medium PETER FLECK, ALFRED HUBLER, Center for Complex Systems Research, Department of Physics, University of Illinois at Urbana-Champaign — We study the classical dynamics computations of metallic spheres immersed in highly viscous, but weakly conducting medium while exposed to the electro-static field of external electrodes of varying geometries. We represent the system's charge dynamics by the spheres' multipole moments as induced by the electrodes. We theoretically derive the force contributions on an individual sphere including feedback effects, and compare these with results from finite-element computations. We find an individual sphere to oscillate between opposite electrodes only if sufficient charge is retained on the sphere on its path for given material parameters of the medium and distance between the electrodes. We discuss the system's parameter ranges necessary for line arrangements of multiple spheres to emerge. Finally, we compare our computations with an experiment of ballbearings in castor oil.

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