 Proceedings of ICCES'08, pp.1415-1415

Slow viscous migration of a conducting solid particle under the action of uniform ambient electric and magnetic fields

Antoine Sellier

Summary

We examine the low-Reynolds-number migration of a conducting and arbitrarily-shaped solid particle freely immersed in a metal liquid of different conductivity when subject to uniform ambient electric and magnetic fields. The boundary formulation established elsewhere for an insulating particle is extended and the incurred particle's rigid-body motion is then obtained by determinating a very few surface quantities on the particle's surface. The behavior of either oblate or prolate conducting spheroids is analytically investigated and the poposed procedure for the challenging case of other non-trivial geometries is implemented and benchmarked against those solutions. The numerical implementation makes it possible to obtain the rigid-body motion of conducting tori and pear-shaped particles. If the conducting torus does not rotate (since orthotropic) and, depending on its shape, is seen to translate like an oblate or a prolate spheroid the pear-shaped particles are by contrast found to translate and rotate therefore experiencing a time-dependent migration. In addition, the rigid-body motion of conducting tori and pear-shaped particles strongly depends not nonly upon the particle's shape and conductivity ratio but also upon the external electric and magnetic fields.