

Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Stable Systems of Charged Sedimenting Particles CHRISTOPHER TROMBLEY, MARIA EKIEL-JEZEWSKA, Institute Of Fundamental Technological Research — The behavior of charged particles settling in a fluid is qualitatively different from the behaviors of settling particles without a fluid or without charge. A foundational qualitative result on the behavior of charged particles in a vacuum is Earnshaw's Theorem, which states that no configuration of particles can be a stable equilibrium. In contradistinction, an explicit example of a stable equilibria for charged particles in a Stokes flow is given. Furthermore, necessary conditions for Lyapunov stability of two interacting charged particles settling in a Stokes fluid are derived from the point force model. The physical parameters of the system are explored to find conditions where stable equilibria can or cannot exist. It is shown that the parameters corresponding to stable equilibria form an open, bounded and connected set. The existence of stable systems of charged sedimenting particles is significant from both fundamental and practical perspectives.

Christopher Trombley
Institute Of Fundamental Technological Research

Date submitted: 01 Aug 2017

Electronic form version 1.4