

Field-Induced Dielectrophoresis and Phase Separation in Suspension

Dawn J. Bennett⁽¹⁾, **Boris Khusid**⁽¹⁾, Conrad D. James⁽²⁾, Paul C. Galambos⁽²⁾, Murat Okandan⁽²⁾,
David Jacqmin⁽³⁾, Anil Kumar⁽⁴⁾, Zhiyong Qiu⁽⁴⁾, Andreas Acrivos⁽⁴⁾

(1) *New Jersey Institute of Technology, University Heights, Newark, USA*

(2) *Sandia National Laboratories, POB 5800, Albuquerque, USA*

(3) *NASA Glenn Research Center, Cleveland, OH 44135, USA*

(4) *City College of New York, 140th St., New York, NY 10031, USA*

We report observations of a new electric field- and shear-induced many-body phenomenon in the behavior of suspensions whose origin is dielectrophoresis accompanied by the field-induced phase separation. As a result, a suspension undergoes a field-driven phase separation leading to the formation of a distinct boundary between regions enriched with and depleted of particles. The theoretical predictions are consistent with experimental data even though the model contains no fitting parameters. It is demonstrated that the field-induced dielectrophoresis accompanied by the phase separation provides a new method for concentrating particles in focused regions and for separating biological and non-biological materials, a critical step in the development of miniaturizing biological assays.

[View the extended summary](#)