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Simultaneous Aggregation and Height Bifurcation of Colloidal Particles near Electrodes in Oscillatory Electric Fields SCOTT BUKOSKY, WILLIAM RISTENPART, Dept. Chemical Engineering, University of California Davis — The behavior of micron scale colloidal particles near electrodes in oscillatory electric fields is known to be sensitive to the identity of the surrounding electrolyte. For example, micron-scale particles suspended in 1 mM NaCl aggregate laterally near the electrode upon application of a low-frequency ($\sim$ 100 Hz) field, but the same particles suspended in NaOH are instead observed to laterally separate. Recent work has revealed that, contrary to previous reports, particles suspended in NaOH indeed aggregate under some conditions while simultaneously exhibiting a distinct bifurcation in average height above the electrode. Here, we elaborate on this observation by demonstrating the existence of a critical frequency ($\sim$ 25 Hz) below which particles in NaOH aggregate laterally and above which the same particles separate. At sufficiently low frequencies, particles still exhibit a distinct height bifurcation, but those particles immediately adjacent to the electrode surface also move laterally to form aggregates. These results indicate that the current demarcation of electrolytes as either aggregating or separating is misleading, and that the key role of the electrolyte instead is to set the magnitude of a critical frequency at which particles transition between behaviors.

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