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In Situ Observations of Electric-Field Induced Nanoparticle Aggregation T.J. WOEHL, N.D. BROWNING, W.D. RISTENPART, Dept. Chem. Engr. Mat. Sci., Univ. California at Davis — Nanoparticles have been widely observed to aggregate laterally on electrodes in response to applied electric fields. The mechanism driving this behavior, however, is unclear. Several groups have interpreted the aggregation in terms of electrohydrodynamic or electroosmotic fluid motion, but little corroborating evidence has been presented. Notably, work to date has relied on *post situ* observations using electron microscopy. Here we present a fluorescence microscopy technique to track the dynamics of nanoparticle aggregation *in situ*. Fluorescent 20-nm polystyrene nanoparticles are observed to form optically visible aggregates in response to an applied AC field. Although single particle resolution is lost, the existence of aggregates on the electrode surface is marked by growing clusters of increasingly bright intensity. We present a systematic investigation of the effects of applied potential and frequency on the aggregation rate, and we interpret the behavior in terms of a mechanism based on electrically induced convective flow.

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