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Dielectrophoresis and Dissociation of Micelles in AC-Electric Fields VICTORIA FROUDE, YINGXI ELAINE ZHU, University of Notre Dame — Dielectrophoresis (DEP) of natural and synthetic colloids has been explored as a new route to rapidly manipulate and assemble colloidal particles in suspensions. Most work has been done with micron to submicron sized particles, yet AC-polarization and dielectrophoretic effects on molecules and nanocolloids remain little understood. In this work, we examine the dynamic responses of micelles to applied AC-electric fields by using fluorescence correlation spectroscopy (FCS) at a single-molecule resolution. We focus on the AC-field induced transport of sodium dodecyl sulfate (SDS) micelles tagged with various fluorescent probes and molecular encapsulates. Micelle concentration and DEP mobility of SDS micelles are examined over a broad range of AC-field frequency (1 KHz -10 MHz) and amplitude (100mV -20V). We observe a strong AC-frequency dependence of micelle concentration, from which the DEP crossover frequency switching between the positive and negative DEP response is determined. Surprisingly, we also observe the AC-field induced dissociation of the micelle structure and the resultant release of fluorescent encapsulates at a characteristic low AC-field frequency of 1-10 kHz; the dissociation frequency can be tuned by encapsulated molecules with a strong dependence of their surface conductivity, which could have a potential application for controlled drug release by AC-electric fields.

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