DYNAMIC MESOSCALE MODEL OF REVERSIBLE ELECTROPHORETIC DEPOSITION

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We present and evaluate a particle-based model of colloidal suspensions that undergo electrophoretic motion and repetitive deposition and resuspension using an extensive set of mesoscale simulations that characterize experimentally relevant colloidal suspensions. In particular, we explore resuspension kinetics under a variety of conditions: electric field strength and cycling frequency, suspension viscosity and electrolyte concentration, and colloid properties, e.g. size and surface potential distributions, non-spherical shapes, and bulk volume fraction. Such studies can reveal the process by which particles accumulate at electrodes and form thin deposits as well as provide insights into the “sticking parameter”[1] that accounts for the fraction of colloids that irreversibly incorporate into the deposit. The model explicitly accounts for inter-colloidal interactions and operates within experimental time and length scales. Thus, simulations can be compared directly against experiment to elucidate reversible electrophoretic deposition systems.

[1] Ferrari, B.; Moreno, R. EPD Kinetics: a Review. Journal of the European Ceramic Society 2010.

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