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Binary Colloidal Assembly by Dielectrophoresis PETER HOFFMAN, YINGXI ELAINE ZHU, University of Notre Dame — Dielectrophoresis (DEP)-driven colloidal assembly has been recently explored as a new route to manipulate colloids and rapidly form nanostructured materials. In this talk, we demonstrate that colloidal particles of varied sizes can be assembled with controllable packing configurations in the presence of AC-electrical fields. We investigate binary latex particles of varied size ratios from 0.25 to 0.8 and directly monitor the dynamic assembly process with final structural characterization by using high-speed confocal microscopy. We observe rich phase behaviors of binary colloidal assembly with a strong dependence of applied AC-field frequency and medium conductivity. The obtained structural phase diagram can be well predicted by the DEP mobility and the Peclet number. We also present a mechanism that underlies the colloidal charge polarization due to charge segregation and entrainment within the double layer at several distinct frequencies, which cannot be explained by the classical Maxwell-Wagner theory. We recently also employ the same mechanism to form binary colloidal crystals.

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