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Vibration Induced Microfluidic Colloidal Island Self-Assembly and Erasure LESLIE YEO, HAIYAN LI, JAMES FRIEND, MicroNanophysics Research Laboratory, Monash University — We demonstrate rich and complex pattern formation arising from the nonlinear dynamics associated with nanometer-order amplitude standing wave vibrations induced along the surface of a piezoelectric substrate upon which a small liquid drop containing a colloidal suspension is placed. At low input powers insufficient to generate streaming in the fluid, colloidal islands are assembled along the drop interface due to the action of the vibration forces directly on the particles. The position and number of these islands directly correlate with the intersection between the nodal positions of the surface waves and that of the induced interfacial capillary wave. As the input power is increased to a critical value corresponding to the onset of fluid streaming, a transient metastable state is observed in which the system oscillates between colloidal island self-assembly in a quiescent fluid and the subsequent temporal erasure of these islands due to the generation of local streaming vortices in the antinodal positions of the surface and capillary waves.

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