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Coalescence avalanches in 2D emulsions: a stochastic approach DANNY RAJ MASILA, RAGHUNATHAN RENGASWAMY, Indian Institute of Technology Madras — One coalescence event in a 2D concentrated emulsion can trigger an avalanche resulting in the rapid destabilization of the drop-assembly. The sensitive dependence of this phenomenon on various factors that include surfactant concentration and viscosities of the fluid phases makes the avalanching problem appear probabilistic. We propose a stochastic framework- that utilizes a probability function to explain local coalescence events- to study the dynamics of the coalescence avalanches. A function that accounts for the local coalescence mechanism is used to fit the experimentally (from literature) measured probability data. A continuation parameter is introduced along with this function to account for the effect of system properties on the avalanche dynamics. Our analysis reveals that this behavior is a result of the inherent autocatalytic nature of the process. We discover that the avalanche dynamics shows critical behavior where two outcomes are favored: no avalanche and large avalanches that lead to destabilization. We study the effect of system size and fluid properties on the avalanche dynamics. A sharp transition from non-autocatalytic (stable emulsions) to autocatalytic (unstable) behavior is observed as parameters are varied.

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