Streak Formation During Convective Deposition

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There are many useful applications of uniform crystalline particle layers. However, micro- and macroscale two and three-dimensional defects can compromise relevant device properties. This work presents a novel technique for studying the prevalence, onset, and development of macroscale instability-driven streak formation in convective deposition. "Streak" behavior is controlled through the use of applied thermal gradients and changing thin film thickness. These experimental conditions enhance and suppress native instabilities, and consequently increase or decrease the likelihood of streak formation. In particular, applied temperature gradients show a clear and scalable ability to control streaking. Streak behavior can be classified into nucleation, combination, and annihilation events. Streaks form and dissipate with very characteristic tendencies. Over all experimental conditions the likelihood of streaks to form, merge, and dissipate follows a cubic power law relation.