Kinetic roughening in a realistic model of non-conserved interface growth

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Abstract-

We provide a quantitative picture of non-conserved interface growth from a diffusive field, placing special emphasis on two main issues, the range of validity of the effective small slopes (interfacial) theories and the interplay between the emergence of morphological instabilities in the aggregate dynamics, and its kinetic roughening properties. Taking for definiteness electrochemical deposition as our experimental field of reference, our theoretical approach makes use of two complementary approaches: interfacial effective equations and a phasefield formulation of the electrodeposition process. Both descriptions allow us to establish a close quantitative connection between theory and experiments. Moreover, we are able to correlate the anomalous scaling properties seen in some experiments with the failure of the small slope approximation, and to assess the effective re-emergence of standard kinetic roughening properties at very long times under appropriate experimental conditions.

Index Terms- free boundary problems (theory), growth instabilities (theory), kinetic roughening (theory)

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Citation:
Nicoli, M.; Castro, M.; Cuerno, R. "Kinetic roughening in a realistic model of non-conserved interface growth", Journal of Statistical Mechanics: Theory and Experiment, vol.2009, no.2, pp.P02036.1-P02036.15, February, 2009.