

NES11-2011-020006

Abstract for an Invited Paper
for the NES11 Meeting of
the American Physical Society

Pattern Formation in Materials

ALAIN KARMA, Department of Physics, Northeastern University

Pattern formation is ubiquitous in nature, from sand ripples formed by wind to the development of a complex biological organism with different organs and a central nervous system. In the realm of materials, patterns are formed invariably when matter is transformed between different solid, liquid or gaseous states far from thermodynamic equilibrium. Material failure is itself mediated by the propagation of cracks that form intricate patterns. Understanding how patterns form and evolve is key to design materials with desired properties and to optimize their performance and safety. This talk will discuss recent progress made to understand three distinct class of patterns including the highly branched snow-flake-like dendritic patterns formed during the solidification process, polycrystalline patterns shaped by grain boundaries, and crack patterns.