An Entropy Based Theory of the Grain Boundary Character Distribution

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Abstract: Cellular networks are ubiquitous in nature. They exhibit behavior on many ditechnologically useful materials are polycrystalline microstructures composed of a myriad of small monocrystalline grains separated by grain boundaries. The energetics and connectivity of the grain boundary network plays a crucial role in determining the properties of a material across a wide range of scales. A central problem in materials science is to develop technologies capable of producing an arrangement of grains—a texture—appropriate for a desired set of material properties. Here we discuss the role of energy in texture development, measured by a character distribution. We derive an entropy based theory based on mass transport and a Kantorovich-Rubinstein-Wasserstein metric to suggest that, to rst approximation, this distribution behaves like the solution to a Fokker-Planck Equation.