

A sharp interface limit in the Giacomin-Lebowitz model of phase segregation

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Abstract

We will discuss the segregation process of two immiscible substances (e.g., oil and water) that have been mixed together. In 1996, Giacomin and Lebowitz proposed a mathematical model for this process that can be viewed as an alternative to the celebrated Cahn-Hilliard equation. They also conjectured that, in their model, the first stage of the phase segregation process, in which the mixture separates into two distinct regions, can be captured on the large scale by a suitable free boundary problem. I will discuss the resolution of this conjecture in one space dimension, in particular the aspects of probabilistic flavor: establishing the existence of a spectral gap for an integral operator governing the problem near the free boundary, as well as the limiting free boundary problem in the context of the probabilistic solution theory recently introduced by Delarue, Nadtochiy and myself.

Based on joint work with Sergey Nadtochiy and Jiacheng Zhang.