

Harmonic Moments of Viscous Fingering Structures in Thin Oil Layers

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The mathematical description of an interface between two immiscible liquids such as oil and water can be extremely difficult because in the usual representation in terms of Fourier modes (or other basis functions), the Fourier coefficients diverge as the interface grows. However, these divergences have been predicted to be absent in a representation of an interface in terms of *harmonic moments*, M_k , which are particular integrals over the interface. Our experiments on air bubbles growing in oil (see example on the right) yield the first results for harmonic moments. The measurements indicate that all M_k (except M_0 , the area) decay with time. Thus the harmonic moment description can be used to obtain new insights into the behavior of fluid interfaces.

