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Spinodal de-wetting of thin films in the presence of oscillatory Casimir forces LEONARDO GOLUBOVIC, ADI CONSTANTINESCU, West Virginia University — Long range de-wetting forces, e.g., van der Waals interactions, may drive the formation of large clusters in thin films of polymeric materials, and in liquid and solid metals films. We elucidate film de-wetting in the presence of spatially oscillatory Casimir forces, such as the fermionic Casimir forces mediated by conducting electrons in metal films. What happens with interfaces of a liquid metal film in the presence of the spatially oscillating forces? Is the film going to exhibit spinodal de-wetting instability yielding the formation of clusters ? We find that, at low temperatures, the film interface pins to the minima of the oscillatory Casimir force potential. This suppresses the spinodal de-wetting. However, at elevated temperatures, the interface efficiently hops between the minima of the oscillatory potential, and the film quickly de-wets and structures into clusters. The spinodal de-wetting is governed by an effective non-oscillatory de-wetting potential that entropically emerges from a coarse-graining of the oscillatory Casimir force potential.

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