

Pattern-induced unbinding of membranes

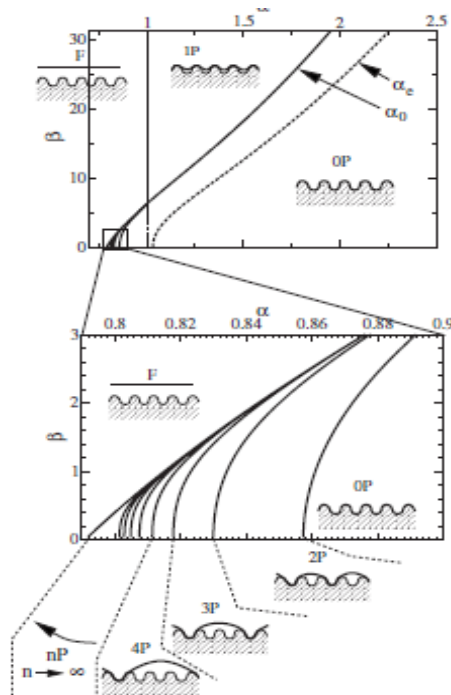
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Abstract

Substrate patterning is shown to be a convenient method to control the adhesion of membranes and filaments¹. The adhesion behavior is found to depend crucially on the shape of the patterns. Fakir-carpet and sinusoidal patterns are studied in detail. We find infinite staircases of periodic partial unbinding transitions, and an unbinding transition when thermal fluctuations are negligible (at low temperatures). The occurrence of adhesion transitions for lipidic membranes is discussed quantitatively.

In the case of filaments at finite temperature², the pattern not only permits a control of adhesion, it also leads to an unbinding phase transition at finite temperatures. The dimensionality of transverse fluctuations controls the continuity of the transition, and in some cases, re-entrant binding is observed as temperature is increased. Finally, we discuss possibility of a pattern-induced unbinding of membranes at finite temperatures³.



¹O. Pierre-Louis, Phys. Rev. E 78, 021603 (2008)

²O. Pierre-Louis, Phys. Rev. E 83, 011801 (2011)

³O. Pierre-Louis, unpublished.