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Phase segregation in the Active Composite Cell Surface: clustering and sorting of cell surface molecules at different scales[1] AMIT DAS, SUVRAJIT SAHA, MADAN RAO, SATYAJIT MAYOR, National Centre for Biological Sciences TIFR, India — Several studies have shown that a variety of cell surface molecules, e.g. GPI-anchored proteins, ras-signalling proteins and many transmembrane receptors, form dynamic nanoclusters driven by actomyosin flows at the cell-cortex. We now ask whether these different species of molecules exhibit a larger scale segregation, depending on their relative binding affinities to actin. Using an effective coarse-grained theory which describes the dynamics of localized contractile platforms or asters, we show that two species of molecules with widely differing binding affinities to actin, segregate over large scales, even at temperatures larger than the equilibrium phase segregation temperature of the binary system. The kinetics of segregation and the statistics of this actively segregated state are dramatically different from its equilibrium counterpart. The kinetics is slow, and shows a breakdown of Porod behaviour, indicating that the segregated domains have low interfacial tension. The domains exhibit macroscopic and intermittent fluctuations at steady state, characteristic of fluctuation dominated phase ordering. At temperatures below equilibrium ordering, activity results in a breakdown of large domains. Many of these predictions are being tested by in-vitro experiments.

[1]Simons Foundation

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