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Active Chemical Thermodynamics promoted by activity of cortical actin BHASWATI BHATTACHARYA, Jawaharlal Nehru Centre for Advanced Scientific Research, Jakkur, Bangalore-560064, India, ABHISHEK CHAUDHURI, KRIPA GOWRISHANKAR, Raman Research Institute, C.V. Raman Avenue, Bangalore 560080,India, MADAN RAO, Raman Research Institute, C.V. Raman Avenue, Bangalore 560080/National Centre for Biological Sciences (TIFR), Bellary Road, Bangalore 560065, India — The spatial distribution and dynamics of formation and breakup of the nanoclusters of cell surface proteins is controlled by the active remodeling dynamics of the underlying cortical actin. To explain these observations, we have proposed a novel mechanism of nanoclustering, involving the transient binding to and advection along constitutively occuring "asters" of cortical actin. We study the consequences of such active actin-based clustering, in the context of chemical reactions involving conformational changes of cell surface proteins. We find that the active remodeling of cortical actin, can give rise to a dramatic increase in efficiency and extent of conformational spread, even at low levels of expression at the cell surface. We define a activity temperature (τ_a) arising due to actin activities which can be used to describe chemical thermodynamics of the system. We plot TTT (time-temparature-transformation) curves and compute the Arrhenius factors which depend on τ_a. With this, the active asters can be treated as enzymes whose enzymatic reaction rate can be related to the activity.

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