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Dynamics of Actively Driven Crosslinked Microtubule Networks VIKRANT YADAV, KASIMIRA STANHOPE, University of Massachusetts, Amherst, ARTHUR A. EVANS, University of Wisconsin, Madison, JENNIFER L. ROSS, University of Massachusetts, Amherst — We have designed a model experiment to explore dynamics of crosslinked active microtubule clusters crosslinked with MAP65. Microtubule clusters are allowed to settle on a slide coated with kinesin-1 molecular motors, which move microtubules. We systematically tune either concentration of cross linkers bound to microtubule (ρ_c) or the global concentration of microtubules (ρ_{MT}). We quantified the shape of the cluster by measuring the standard deviation (σ) of the cluster outline. At low ρ_{MT} or ρ_c the network is in an expanding state. At higher ρ_{MT} or ρ_c expansion slows down, reaches zero at a critical density, and become negative indicating contraction. Further increase of ρ_{MT} or ρ_c halts any kind of dynamics. The ρ_{MT}-ρ_c phase space shows distinct regions of extensile, contractile and static regimes. We model these results using active hydrodynamic theory. Microtubules are modeled as active rods whereas effect of crosslinkers is modeled using a collision term that prefers anti-parallel alignment of microtubules. A linearized analysis of hydrodynamic equation predicts existence of density driven expanding, contracting, and static phases for microtubule clusters.

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