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Shape-Conserved Dynamic Condensation in the Process of Aster Formation from a System of Microtubules and Cross-Linked Kinesin Motors K. KIM, A. SIKORA, WPI-AIMR, Tohoku University, Japan, H. NAKAZAWA, Dept of Biomolecular Engineering, Graduate School of Engineering, Tohoku University, Japan, M. UMETSU, WPI-AIMR/Dept of Biomolecular Engineering, Graduate School of Engineering, Tohoku University, Japan, W. HWANG, Dept of Biomedical Engineering/Materials Science and Engineering, Texas A&M University, USA; School of Computational Sciences, KIAS, Korea, W. TEIZER, WPI-AIMR, Tohoku University, Japan; Dept of Physics and Astronomy/Materials Science and Engineering, Texas A&M University, USA — We report fluorescence microscopy studies of a cellular element-based active system that is composed of rhodamine-labeled microtubules and functionalized kinesin motor proteins, cross-linked via streptavidin-coated quantum dots. The motor proteins organize microtubules into aster-like structures containing core aggregations of the quantum dot-motor protein complexes. The cores result from the dynamic condensation of sub-clusters that are connected to each other randomly. The inter-cluster distance decays exponentially with time during the condensation. Intriguingly, the shape defined by lines connecting the clusters is well conserved while the dynamic process reduces the size. This shape conservation is governed by a scaling behavior during the condensation, following a power law with respect to the distance between sub-clusters. We explain this isomorphic contraction during the aster formation process using a simple mechanistic model.

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