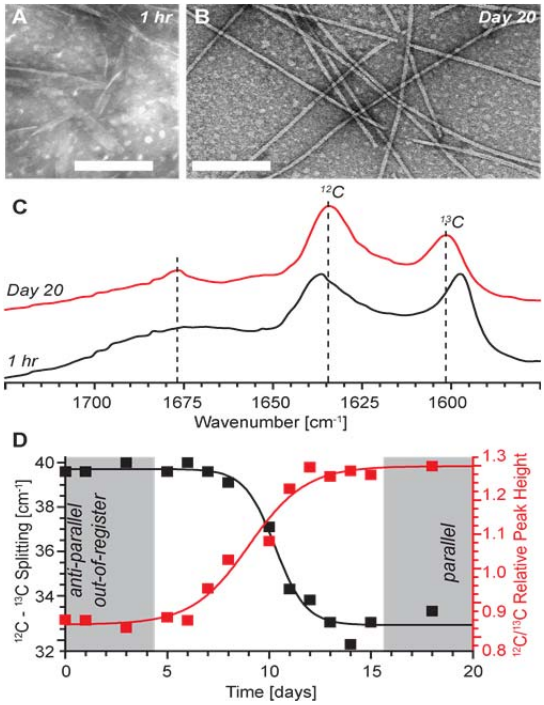
Kinetic Intermediates in Dynamic Conformational Networks of Biopolymer Self-assembly

David G. Lynn*, Jillian Smith, Chen Liang, Anil K. Mehta, Rong Ni, Sha Li, Noel Li, Allisandra Mowles, & Michael Tseng Departments of Biology and Chemistry, Emory University, Atlanta, GA 30322*

The milieu of functional complex fluids with its dense arrays of phases and dynamic surfaces contained within the eukaryotic cell guides biopolymer folding and supramolecular assembly in remarkably diverse ways. Proteins and peptides can also access diverse paracrystalline morphologies in far simpler and often abiotic fluids. The competing tensions between growth and nucleation in these fluid matrices may mirror biopolymer mutualisms[1,2] of the central dogma, as well as the epigenetic evolution of misfolding protein functions. It remains to be determined whether a low probability transition gives rise to a critical polymorph of disease relevance, or a progressive series of transitions contribute to a phylogeny of forms, but these forms are now increasingly relevant to astrobiology and non-terrestrial environments. Here we describe a series of kinetic selections that occur in metastable phases, and define supramolecular intermediates that are critical to understanding the complex environmental inputs guiding supramolecular evolution.[3-5] By combining top-down causality with bottom-up emergence, we show how kinetic selection might lead to a conformational phylogeny that traverse the length scale from molecules to cells.



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