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Enhanced self-assembly of actin encapsulated in polypeptide coacervates PATRICK M. MCCALL, Univ of Chicago, SAMANVAYA SRIVASTAVA, Univ of Chicago and Argonne National Lab, SARAH L. PERRY, Univ of Massachusetts at Amherst, DAVID R. KOVAR, MARGARET L. GARDEL, Univ of Chicago, MATTHEW V. TIRRELL, Univ of Chicago and Argonne National Lab
— Proteins typically exist and do the work of the cell in crowded environments, in stark contrast to the dilute solution limit traditionally used to study biomolecular properties and interactions. This begs the question of how crowded environments with plentiful weak interactions impact biologically important molecular reactions. Building on recent success encapsulating the model protein bovine serum albumin (BSA) in the crowded interior of liquid polyelectrolyte-complex coacervates, we use polypeptide coacervates as a platform to examine the electrostatically-driven self-assembly of the ubiquitous protein actin into linear filaments. Remarkably, in spite of the high concentration of strongly charged molecules in the coacervate interior, we observe that actin is still capable of assembling into micron-long filaments. In contrast to the uniform distribution of the non-reactive BSA inside coacervates, we find the F-actin is strongly peripherally localized, perhaps owing to depletion interactions. Additionally, we observe that the rate of actin self-assembly is enhanced >50-fold inside coacervates. Consistent with an increase in the local protein concentration in coacervates, encapsulated actin assembles below the critical concentration of bulk solution.

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