43d The Polymerization of Actin: Structural Changes from Small Angle Neutron Scattering

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We present a new analysis of small angle neutron scattering data from rabbit muscle actin, in the course of the polymerization from G-actin to F-actin as a function of temperature. The data, from Ivkov et al. [R. Ivkov, J. G. Forbes, and S. C. Greer, J. Chem. Phys. 108, 5599 (1998)], were taken in D2O buffer, with Ca2+ as the divalent cation on the G-actin, in the presence of ATP, and with KCl as the initiating salt. The new analysis of the data using modeling and the method of Generalized Indirect Fourier Transform (of O. Glatter and coworkers) provides shapes and dimensions of the G-actin monomer and of the growing actin oligomer in solution, as a function of temperature and salt concentration. This analysis indicates the G-actin monomer, under the conditions given above, is a sphere 50-54 angstroms in diameter, as opposed to the oblate ellipsoid seen by x-ray crystallography. The F-actin dimensions are consistent with x-ray crystal structure determinations.