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Energetics and Dynamics of Constrained Actin Filament Bundling LE YANG, Phys. Dept., Washington University, DAVID SEPT, Dept. of Biomedical Engineering, Washington Unversity, ANDERS CARLSSON, Phys. Dept., Washington University — The formation of filopodia-like bundles from a dendritic actin network has been observed to occur in vitro as a result of branching induced by Arp2/3 complex. We study both the energetics and dynamics of actin filament bundling in such a network in order to evaluate their relative importance in bundle formation processes. Our model considers two semiflexible actin filaments fixed at one end and free at the other, described using a normal-mode approximation. This model is studied by both Brownian dynamics and Monte Carlo energetics methods. In the dynamic simulations, we evaluate the time required for the filaments to interact and bind, and examine the dependence of this bundling time on the filament length, the distance between the filament bases, and the crosslinking energy. For most of the cases we have studied, the energetics and dynamics simulations give similar results for critical distance. Over a broad range of conditions, we find that the times required for bundling from a network are compatible with experimental observations.

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