MAR12-2011-009293

Abstract for an Invited Paper
for the MAR12 Meeting of
the American Physical Society

Enhancing Biopolymer Dynamics through Destruction

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Microtubules are cytoskeletal filaments that organize intracellular space structurally and through active transport along their lengths. They need to be organized and remodeled quickly during development of differentiated cells or in mitosis. Much work has focused on remodeling from the ends because these long polymers can stochastically disassemble through dynamic instability or be actively disassembled. Microtubule-severing enzymes are a novel class of microtubule regulators that create new ends by cutting the filament. Thus, these proteins add a new dimension to microtubule regulation by their ability to create new microtubule ends. Interestingly, despite their destructive capabilities, severing has the ability to create new microtubule networks in cells. We are interested in the inherent biophysical activities of these proteins and their ability to remodel cellular microtubule networks. Interestingly, despite their destructive capabilities, severing has the ability to create new microtubule networks in cells. We use two-color single molecule total internal reflection fluorescence imaging to visualize purified severing enzymes and microtubules *in vitro*. We have examined two families of severing enzymes to find that their biophysical activities are distinct giving them different network-regulating abilities.