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Multi-scale dynamical modes of a tethered membrane by Monte Carlo simulations RAS PANDEY, University of Southern Mississippi, KELLY ANDERSON, The Proctor & Gamble Company, BARRY FARMER, Air Force Research Laboratory — A tethered membrane can be described by tethered nodes in a flexible sheet. We consider a square sheet with nodes connected by fluctuating bonds on a cubic lattice with each node executing its stochastic movement within the constraints of its bond-lengths. Although each interior node is connected by four of its neighboring node, there can be multiple pathways between two nodes for dynamical modes to propagate. While the motion of the centre of mass provides global dynamics of the membrane, movement of an interior node is crucial in understanding the segmental mode dynamics. Characteristic of sheet is controlled by node-node interaction and bond strength while the empty lattice sites constitute an effective solvent medium via node-solvent interaction. Each node executes its stochastic motion with the Metropolis algorithm subject to bond fluctuations, excluded volume constraints, and interaction energy. Conformational relaxation and dynamics of the sheet are examined at a range of temperatures in different solvent media. Variations of the mean square displacement of the center node of the sheet and that of its center of mass with the time steps exhibit multi-scale mode dynamics, and therefore, visco-elastic responses. Relaxation of the gyration radius are also examined.

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