565d Multiscale Simulation Studies on Mechanisms of Poration for Hydrolytically Degradable Diblock Copolymer Membranes

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Dissipative particle dynamics computer simulations are proposed to give a molecular understanding to the application of aqueous diblock copolymer systems to drug delivery. The use of a hydrolysable monomer as the hydrophobic block leads to a destabilization of the vesicle membrane due to the increase in the hydrophilic molecular weight fraction (fEO) of the chains, which makes them prefer high curvature conformations such as worm-like and spherical micelles. Experimental work suggests that aggregation of these micelle forming chains provokes a local phase transition to the micellar state, causing poration of the membrane with eventual release of the encapsulated hydrophilic drug and disintegration of the vesicle. In this study, free-energy techniques are employed to examine the microdomain formation by high fEO chains, leading to poration, by using a coordination number reaction coordinate. Additionally, results from atomistic studies on percolation of water into the membrane hydrophobic core will be reported for PLA.