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Modeling the Dynamic Interactions between Polymeric Membranes and Target Species

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One of the most important properties of biological membranes is their ability to regulate the passage of various chemical components in and out of a cell. Inspired by the elegance and robustness of this process, we examine a polymeric membrane that encircles an interior polymeric domain and examine the extent to which this synthetic membrane can be driven to engulf various targets and incorporate these species into the interior domain. To carry out this study, we developed a computational, dynamic mean-field model. We examine how the physical characteristics of both the target species and the interior polymeric domain affect the ability of the target to enter the system and the membrane to close after the target is localized in the core. The findings can provide guidelines for designing synthetic vesicles that can be used in applications that involve the active uptake and removal of species from a fluid environment.