# AMPHIPILIC BLOCK COPOLYMER VESICLE FORMATION AND ITS BEHAVIOR IN SELECTIVE SOLVENT

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## ABSTRACT

A polymer vesicle is an enclosed structure of the molecular bilayer. It is assumed to play an important role in biological activity and has been used to mimic cells. Moreover, vesicles may have special applications in many fields, including drug delivery, microreactors, and so on. In the past decade, we studied amphipilic block copolymer vesicle formation and its behavior in selective solvent by experiment and computer simulation.

Firstly, self-assembly of an ABA amphiphilic triblock copolymer into vesicles in dilute solution was studied by successfully combining experimental methods and a real-space self-consistent field theory in three-dimensional space. It was found experimentally that vesicle size was sensitive to the initial copolymer concentration in the organic solvent. A number of complex vesicles, such as global, long-style, trigonal, and necklace-like vesicles, were obtained in the experiments. Our simulations confirm that the structural complexity coexisting behavior in the single-amphiphile systems is largely attributed to the metastability rather than the polydispersity of the triblock copolymer.

Secondly, the kinetics of vesicle formation of ABA amphiphilic triblock copolymers from an initially homogeneous state was theoretically and experimentally investigated. The results showed the pathway of spontaneous vesicle formation depended greatly on annealing rate.

Finally, we found that the polymeric vesicles from the self-assembly of amphiphilic block copolymer in the dioxane/water mixture can be deformed, broken and finally divided into smaller ones via the external electrostatic field. Moreover, this phenomenon can be used to control the release behavior of the vesicles. Our experimental results show that the Nile Red (NR) molecules encapsulated inside the cavity of vesicles can be accurately released by controlling the electrostatic field intensity and the release time.

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**References:**

[1]Wu M., Zhu Y., Jiang W., *ACS Macro Lett.* 2016, 5, 1212−1216.
[2]Han Y., Yu H., Du H., Jiang W., *J. Am. Chem. Soc.* 2010, 132, 1144–1150.
[3]Zhu J., Jiang Y., Liang H., Jiang W., *J. Phys. Chem. B* 2005, 109, 8619-8625.