Design, Synthesis and Characterization of Protease sensitive Polymeric Vesicles

Wai Kit Yeung[1] and Ying Chau[2 *]

Division of Biomedical Engineering [1] and
Department of Chemical and Biomolecular Engineering [2],
The Hong Kong University of Science and Technology

ying.chau@ust.hk

Submicron-sized polymeric vesicles with peptide building block exhibit morphology change upon the addition of specific proteases. The polymeric vesicles self-assemble in aqueous solution from the peptide-polymer hybrids, which consist of a hydrophilic polymer block of polyethylene glycol (PEG), a tetrapeptide linker cleavable by proteases of interest, and a hydrophobic polymer block of polycaprolactone (PCL). The hydrophilic-hydrophobic balance of the peptide-polymer hybrids renders their self-assemblies into stable polymeric vesicles under aqueous conditions, and the disruption of such balance are proposed to destabilize the polymeric vesicles. During the incubation with the model protease that recognizes the tetrapeptide linker as a preferred substrate, the hydrodynamic diameter of the polymeric vesicles increased. The size change was negligible when either the protease was replaced by one with dissimilar substrate preference or the vesicles were prepared with diblock copolymers (containing no peptide linker). The modular synthesis procedure of peptide-polymer hybrids based on orthogonal chemistry means that polymeric vesicles can be prepared to respond to other proteases of interest, with potential biomedical applications such as biosensing and drug delivery.