学際物質科学研究センター(TIMS)セミナー

題目： 『Synthesis and Characterization of Stimulus-Responsive Biocompatible Block Copolymers』

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場所： 総合研究棟 B 0110 公開講義室

概要：

Atom Transfer Radical Polymerisation (ATRP) is used to synthesise a wide range of stimulus-responsive block copolymers based on 2-(methacryloyloxy)ethyl phosphorylcholine [MPC], a commercially available monomer that confers clinically proven biocompatibility. For example, AB diblock copolymers comprising MPC and 2-(diisopropylamino) ethyl methacrylate [DPA] form nano-sized micelles with highly hydrophobic cores under physiological conditions. These MPC-DPA diblock copolymer micelles can be loaded with up to 5 w/w % of anti-cancer drugs such as taxol or tamoxifen, which can be released when the local (intra-cellular) pH falls to 5.5 due to the pH-sensitive nature of the DPA block. Moreover, the use of functional ATRP initiators allows folic acid groups to be placed on the end of the MPC blocks, which enables cell targeting strategies to be explored via a folate receptor mechanism. Replacing the DPA block with 2-(dimethylamino)ethyl methacrylate [DMA] allows efficient condensation of DNA: the precise morphology of the copolymer:DNA complex depends markedly on the block composition. If MPC comprises the central 'B' block of an ABA triblock copolymer, either pH-responsive (A = DPA) or thermo-responsive (A = *N*-isopropylacrylamide) gelators can be obtained. Soft, free-standing gels can be obtained that are sufficiently biocompatible to enable V79 hamster lung cells to be cultured. Similarly, new ABC triblock copolymers are being evaluated as doubly thermo-responsive gelators. Preliminary studies indicate an intriguing local minimum in solution viscosity just prior to gelation, which is interpreted in terms of intra-micellar collapse followed by inter-micelle association. Future directions include new asymmetric AB diblock copolymers for the construction of biocompatible block copolymer vesicles and the design of biochemically-responsive hydrogels.

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