

研究论文

三嵌段共聚物PAN-*b*-PEG-*b*-PAN的合成及其自组装行为的研究

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摘要 利用原子转移自由基聚合(ATRP)制得了分子量可控、分子量分布窄的聚丙烯腈-*b*-聚乙二醇-*b*-聚丙烯腈P(AN-*b*-PEG-*b*-PAN)嵌段共聚物. 通过¹H NMR, FTIR, 凝胶渗透色谱(GPC)对所得产物的结构和分子量进行了表征并通过TG和DTA考察了该嵌段共聚物的热稳定性; 运用透射电子显微镜(TEM)、荧光探针技术和动态光散射(DLS)研究了P(AN)₂₇-*b*-P(EG)₄₅-*b*-P(AN)₂₇在溶剂水中胶束的形成、结构、形貌和胶束粒径. 结果表明, 三嵌段共聚物P(AN)₂₇-*b*-P(EG)₄₅-*b*-P(AN)₂₇的热稳定性较纯聚乙二醇PEG好, 且柔性链PEG的引入对嵌段共聚物的放热峰位置没有显著的影响. 当改变此嵌段共聚物溶液浓度时, 该嵌段共聚物会自组装成不同形状的胶束, DLS测量的胶束粒径大于TEM观察的结果, 其临界胶束浓度(cmc)约为 $4.46 \times 10^{-4} \text{ g} \cdot \text{L}^{-1}$.

关键词 [原子转移自由基聚合](#) [嵌段共聚物](#) [自组装](#)

分类号

Study on Synthesis of PAN-*b*-PEG-*b*-PAN Triblock Copolymer and the Self-assembly Behaviors

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Abstract Atom transfer radical polymerization (ATRP) was used to synthesize the block copolymers of poly(acrylonitrile)-*b*-poly(ethylene-glycol)-*b*-poly(acrylonitrile) (PAN-*b*-PEG-*b*-PAN). The copolymers were characterized by using ¹H NMR, FTIR spectra and gel permeation chromatography (GPC). The thermostabilities of these copolymers were investigated by TG and DTA. Transmission electron microscope (TEM), fluorescence spectroscopy and dynamic light scattering (DLS) were used for the investigation of the self-assembly of the copolymers. Comparing the thermostabilities of PEG, the thermostabilities of P(AN)₂₇-*b*-P(EG)₄₅-*b*-P(AN)₂₇ were improved and the exothermic peak position of the copolymers had no obvious changes when PEG blocks existed. The results of the TEM observations showed that polymeric micelles of P(AN)₂₇-*b*-P(EG)₄₅-*b*-P(AN)₂₇ copolymers were almost different shaped, when P(AN)₂₇-*b*-P(EG)₄₅-*b*-P(AN)₂₇ copolymer concentrations were altered and micelle size obtained from DLS was bigger than that from TEM and the critical micelle concentration (cmc) of the copolymers was $4.46 \times 10^{-4} \text{ g} \cdot \text{L}^{-1}$.

Key words [atom transfer radical polymerization](#) [block copolymer](#) [self-assembly](#)

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