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论文

含mPEG侧链的水溶性梳状聚合物的合成及其侧链受限结晶行为研究

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摘要 采用大单体与小单体共聚的技术, 通过自由基引发溶液聚合, 合成了一系列水溶性梳状聚合物——聚丙烯酸接枝聚乙二醇单甲醚(PAA-*g*-mPEG). 制备过程分两步进行, 首先合成大单体聚乙二醇单甲醚丙烯酸酯, 然后将大单体与丙烯酸单体共聚, 合成了梳状聚合物. 通过控制反应条件, 获得了一系列主链和支链组成比不同的接枝共聚物. 用傅立叶变换红外光谱(FT-IR)和核磁共振氢谱(^{1}H-NMR)表征了共聚物的结构, 并对其侧链的结晶行为进行了研究. 采用差热扫描量热法(DSC)表征并分析了不同侧链长度的mPEG的热性能及其结晶情况. 利用相差显微镜和原子力显微镜(AFM)观察薄膜的结晶形貌, 表明梳状聚合物的侧链mPEG在受限条件下的薄膜结晶形貌为高度支化的晶体, 初步分析了mPEG链长及其在共聚物中的重量百分含量对晶体形貌的影响.

关键词 聚丙烯酸 聚乙二醇单甲醚 梳状聚合物 相形态 结晶 薄膜

分类号

SYNTHESIS OF WATER_SOLUBLE,COMB_LIKE POLY(ACRYLIC ACID)-*g*-POLY[(ETHYLENE GLYCOL)METHYL ETHER] COPOLYMERS AND THE CRYSTALLIZATION BEHAVIOR OF PEG SIDE CHAINS

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Abstract A series of water-soluble comb-like copolymers poly(acrylic acid)-*g*-poly[(ethylene glycol)methyl ether] (PAA-*g*-mPEG)were synthesized by free-radical copolymerization of acrylic acid and mPEG monoacrylate macromonomers in *iso*-propanol solutions. The macromonomer was prepared by acrylation of monomethoxy poly (ethylene glycol)with aecrJoyl chloride. The characterization of the macromonomer and these copolymers was carried out by Fourier transform infra—red(FT—IR)and nuclear magnetic resonance(^{1}H-NMR)spectroscopy. The glass transition temperature and melting temperature of the mPEG side—chains were detected by using DSC. It was found that the shorter the side chains,the higher the T_g is,and the mPEG side—chains in the copolymer could crystallize from the solution,but not easily from the melt. It implies that the movement of the side chains is strongly confined by the backbone and depends on the side chains length. Furthermore,the crystalline and phase morphologies of the comb—like copolymer films prepared by means of spin—coating on glass substrates were observed by phase contrast microscope and AFM. A lot of interesting crystalline and phase morphologies were found in the PAA—*g*—mPEG films.

Key words Poly（acrylic acid） Poly（ethylene glycol） methyl ether Comb-like copolymer Water-soluble Crystallization Phase morphology Film

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