

论文

H型(PS)₂PEG(PS)₂嵌段共聚物在旋涂过程中的结晶行为

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摘要:

采用原子力显微镜和X射线衍射等手段研究了H型(PS)₂PEG(PS)₂嵌段共聚物在不同溶剂和不同浓度的溶液中旋涂所得薄膜的形貌, 并与聚乙二醇(PEG)均聚物进行了比较. 虽然(PS)₂PEG(PS)₂中PS的链长很短, 但对形貌有很大影响, PS链段的存在改变了聚合物在基底上的稳定性, 使用四氢呋喃为溶剂, 当溶液浓度较小时, 在旋涂过程中发生去润湿, 然后再发生结晶, 膜厚较大时去润湿被抑止, 所得形貌与PEG均聚物类似. 以甲苯为溶剂时, 由于PEG和PS与溶剂的相互作用不同, 共聚物在溶液中形成胶束, 从而改变了聚合物的结晶形貌.

关键词: 嵌段共聚物; 结晶; 旋涂; H型

Crystallization of H-Shaped (PS)₂PEG(PS)₂ Block Copolymer During Spin Coating

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Abstract:

The morphologies of H-shaped (PS)₇₂PEG₂₂₇(PS)₇₂ block copolymer films spin coated onto silicon wafers from different solutions were investigated by means of atomic force microscopy(AFM) and grazing incidence X-ray diffraction. We further compared the crystallization of H-shaped block copolymer with that of poly(ethylene oxide)(PEG) homopolymer. The presence of PS block changed the interaction of polymer and substrate. When solvent was tetrahydrofuran, the copolymer dewetted and crystallized after spin coating when the concentration of solution was 0.1% and 0.25%. As the concentration increased to 0.5%, dewetting was suppressed and two-dimensional spherulites appeared. If toluene was used as solvent, micelles were formed in the solution due to the differences between solubility of PEG and PS block, which changed the final film morphologies. Dendritic crystals containing edge-on and flat-on crystals appeared from the 0.1% solution. More compact crystals appeared while the concentration increased, and large square lamellae was observed after spin-coating of 0.5% solution.

Keywords: Block copolymer; Crystallization; Spin coating; H-shape

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