

Studies on Phase Separation in a-PMMA/PEG Gels\textsuperscript{1} XIAOLIANG WANG, LIANG LI, DONGSHAN ZHOU, GI XUE, Department of Polymer Science and Engineering, Nanjing University — Stereo-irregular atactic poly(methyl methacrylate) (a-PMMA) is known incapable of forming gels in common solvents, irrespective of the solvent quality. However, we recently found a rigid opaque thermal-reversible a-PMMA gel in the solvent of the polyethyl glycol oligomer (PEG) (the PEG molecule mass differ from 400 to 4000 were used). FT-IR, dynamic mechanical temperature analysis and Solid state NMR measurements were used to study the gel properties and gelation mechanism. The \textit{in situ} IR studies in a-PMMA/PEG gel suggested that some a-PMMA segments were in the aggregated state in solution, which became a node in the solution. With decreasing temperature, the fraction of aggregated a-PMMA in solution increases, resulting in the formation of physical network finally. Spin diffusion was used to determine the size ($\xi$) of domains in the gels. We found that, a-PMMA/PEG4000 was miscible ($\xi \sim 9\text{nm}$), while a-PMMA/PEG1000 was micro phase separated ($\xi \sim 57\text{nm}$) and a-PMMA/PEG400 was macro phase separated ($\xi > 300\text{nm}$). The a-PMMA self-aggregation was attributed to the depletion interaction that becomes important in the case of middle-sized solvents.

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