SYNTHESIS AND CHARACTERIZATION OF SMI COPOLYMER NANOPARTICLES AND THEIR SURFACE MODIFICATION

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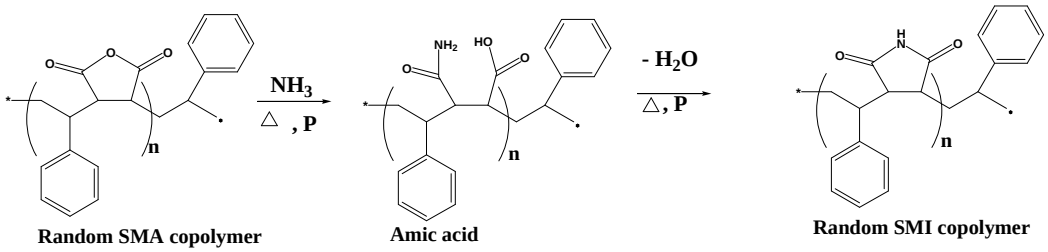
ABSTRACT

A statistical copolymer of styrene-maleic anhydride (SMA) was reacted with ammonia at high pressure and temperature to prepare styrene-maleimide (SMI) copolymer nanoparticles (NPs) in aqueous media. Traditionally maleic anhydride reacts with primary amines to form imides. This is a two-step reaction, which first yields an amic-acid. The second step involves ring-closure, where the amic-acid forms an imide at high temperature (scheme 1 below). The reaction of the ammonia with maleic anhydride on the backbone of the SMA copolymer at high temperature and high pressure results in the spontaneous formation of NPs. The influence of parameters such as concentration, maleic anhydride content of the copolymer and molecular weight of the copolymers were studied. It was realized that the increase in the weight percentage of solid content in the solution results in an increase in NP size. Also, the higher the molecular weight the larger the NPs became. The mechanism of particle formation under these conditions will be discussed.



Scheme 1. Reaction of SMA copolymer with ammonia in water

Scanning electron microscopy (SEM), transmission electron microscopy (TEM) and dynamic light scattering (DLS) were used to study the morphology and distribution of the SMI copolymer nanoparticles. Fourier transform infrared (FTIR) spectroscopy was used to study functional groups.

References

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(2) Liang, P.; Meng, Z.; Jiang, Z.; Nie, J.; He, Y. *Journal of Polymer Science: Part A: Polymer Chemistry*, **2010**, *48*, 5652–5658.