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Preparation, Structure, and Properties of Hydroxyl Containing Acrylate Monomer Grafted Silk Fabrics by HRP-Catalyzed ATRP Method

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Abstract : It is environmentally friendly to use horseradish peroxidase (HRP) instead of the traditional transition metal catalyst for the catalyst of atom transfer radical polymerization (ATRP). Silk fabrics were successfully grafted with hydroxyl-containing acrylate monomer to improve its crease resistance by HRP-catalyzed ATRP method. Taking grafting yield as the evaluation index, single factor tests revealed that the optimum grafting reaction condition was as follow: monomer mass fraction 120-210%(o.w.f), HRP concentration 360-480U/mL, molar ratio of HRP to NaAsc 1:150, reaction temperature 50-60℃, reaction time 24h. Raman spectra showed hydroxyl-containing acrylate monomer were successfully grafted on silk fabrics. SEM figures indicated the surface of grafted silk became rougher, and graft copolymer was distributed evenly on the surface of silk fiber. The crease-resistant recovery property of grafted silk fabric was greatly improved, especially in wet crease recovery angle. The result showed hydroxyl-containing acrylate monomer can be successfully grafted onto silk fabric based on HRP-catalyzed ATRP method.

Keywords : atom transfer radical polymerization, catalysis, horseradish peroxidase, hydroxyl-containing acrylate monomer
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