

PREPARATION OF POLYSTYRENE/POLY(ACRYLIC ACID) COMPOSITE PARTICLES BY SEEDED DISPERSION POLYMERIZATION IN AN IONIC LIQUID

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Up to the present, the polymer industries have used large amounts of volatile organic compounds (VOC) as a medium to prepare polymer. However, the adverse effect of VOC on the environment has become a serious problem. Consequently, a shift to environmental friendly media such as water is under way. In the last decade, there has been increasing interest in the use of ionic liquids as environmentally friendly solvents due to their low vapor pressures, chemical and thermal stability, and non-flammability. In the field of polymer chemistry, application of ionic liquids as solvents for polymerization processes is gradually receiving increased attention. Recently we succeeded in preparing polystyrene (PS) particles by dispersion polymerization in an ionic liquid for the first time¹⁾.

In this presentation, preparation of PS/poly(acrylic acid) (PAA) (hydrophobic/hydrophilic) composite particles was demonstrated by seeded dispersion polymerization of acrylic acid (AA) in the presence of PS particles in an ionic liquid, *N,N*-diethyl-*N*-methyl-*N*-(2-methoxyethyl)ammonium bis(trifluoromethanesulfonyl) imide ([DEMMA][TFSI]). Submicron-sized, monodisperse PS particles were prepared by dispersion polymerization of styrene in [DEMMA][TFSI] with poly(vinyl pyrrolidone) as stabilizer. Seeded dispersion polymerization of AA was subsequently carried out with PS seeds in [DEMMA][TFSI] for the preparation of PS/PAA composite particles. Fig. 1 shows a scanning electron microscope (SEM) photograph, as well as a transmission electron microscope (TEM) photograph of ultrathin cross sections, of the particles obtained in the seeded dispersion polymerization. These photographs reveal that the obtained particles have a core-shell morphology consisting of a PS core and a PAA shell. Successful preparation of PS/PAA composite particles in an ionic liquid has been demonstrated.

1) H. Minami, K. Yoshida, M. Okubo, *Macromol. Rapid Commun.* **29**, 567 (2008)

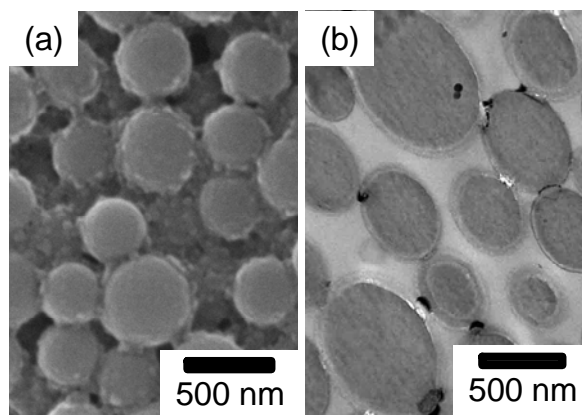


Fig. 1 SEM photograph of PS/PAA (2/1, w/w) composite particles (a) and TEM photograph of ultrathin cross section of PS/PAA composite particles stained with RuO₄ vapor for 30 min (b)