

SUMMARY OF Ph.D. DISSERTATION

School Graduate School of Science and Technology, KEIO UNIVERSITY	Student Identification Number	SURNAME, First name TAKASU, Mayuko
Title Preparation of colored particles with high dye content and improvement of their properties		
Abstract These days, in the field of colorant such as ink and paint, organic volatiles become undesirable because of safety, health and environmental reasons and aquation is generally required. We aimed to prepare “colored latex” with high dye content by miniemulsion polymerization for the purpose of the development of the third colorant next to dye and pigment. “Colored latex” is the oil-soluble dye-loaded latex with the particle size less than 500nm. Up to now, many other groups have tried to prepare colored latex but the dye-loading in the latex has not been enough as a colorant. Miniemulsion polymerization method is more suitable for the synthesis of colored latex with high dye content than conventional emulsion polymerization. Colored latex containing phthalocyanine dyes up to 30wt.% was prepared. The dyes suitable for colored latex are selected and blended so that colored latex shows enough strong color depth as a colorant. The absorption spectra of the latex products indicated that dyestuff aggregates had been formed inside the latex particle by π-π interaction. Yellow colored latex containing styryl dyes was also prepared. Styryl dye content determined by elemental analysis of latex particles was more than 40wt.%. One of the most important properties of colorant is its fastness to light. Hindered amine stabilizers (HAS) were used to improve photostability of colored latex. Latex particles containing azo dyes and HAS were prepared. The effect of HAS in colored latex was investigated both as an additive and as a comonomer. In case of colored latexes containing HAS combined with matrix polymer by a covalent bond, the optimal amount of HAS for photostability improvement was between 8%-20% and the effect was prolonged compared with the simply mixed HAS system. The stability of the latex product during storage was unsatisfactory, since the migration of dyes from the latex particles occurred. The dye molecules that migrate from the latex to the aqueous phase form dyestuff aggregates in water and they precipitate after several days. The dye migration property depended on the diffusion rate of dye molecules in latex particles. In order to obtain good dye preservation property, it is suggested that bulky dye molecules be selected for preparation of colored latex. We suggested another technique that improves dye preservation property of colored latex. Colored latexes with polyurea shell were prepared by applying interfacial polycondensation reaction to miniemulsion polymerization process. These colored latexes were composed of polystyrene core and polyurea shell, and their particle size was adjusted to <100nm. Core-shell particles exhibited better dye preservation properties than reference standards. It indicated that polyurea shell could prevent dye molecules from migrating into aqueous phase to a degree. The ability to prevent dye migration depended on compositions of polyurea shells.		