

Ellipsoidal polyimide particles for UV protective agents

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It was reported that polymer particles of ellipsoidal and needle shape have high UV-ray scattering effect. In most cases, polymer particles prepared by emulsion and precipitation polymerization are spherical shapes, which are thermodynamically stable shapes. To obtain nonspherical polymer particles, complicated methods are necessary. In a few cases, the ratio of several kinds of solvents, monomers, and emulsifiers are precisely controlled to obtain nonspherical particles during polymerization. On the other hand, nonspherical particles are transformed from spherical particles by complicated processes.

Polyimide (PI) fine particles prepared by precipitation polymerization has already reported. Recently, it has been found that the PI particles transform from spherical to ellipsoidal by stirring in a solvent. In this study, the stirring conditions for transformation from spherical to ellipsoidal were investigated. Furthermore, the thermal stability and optical properties of the resulting ellipsoidal PI particles were evaluated.

Various kinds of stirring bar were applied, and cylinder-shape stirring bar was most effective to transform PI particles. Destruction of particles were observed when the dispersion of PI particles stirred with a glass stirring bar in a glass bottle. Transformed PI particles were not obtained in chloroform, ethylene glycol, and isopropyl alcohol. These results suggested that PI particles transformed at the clearance between the stirring bar and the vessel. Ellipsoidal PI particles with around 0.6 times the thickness and around 1.3 times the axial length of the original size were obtained by optimizing the stirring condition.

The shape of ellipsoidal PI particles was retained after heating at 150 °C for 2 h. The dispersion of ellipsoidal PI particles showed lower UV-Visible transmittance than that of spherical particles. The transmittance of acrylic polymer films with PI particles dispersed on surface or inside was also measured. Under both conditions, ellipsoidal PI particles showed lower UV transmittance than that of spherical PI particles.