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Abstract
The synthesis of poly (amic acid) (PAA) was based on 4,4′-oxydianiline (ODA) and pyromellitic dianhydride (PMDA). The various amounts of nanoscale γ-Al2O3 were well dispersed in NMP by a physical dispersion method. Then, the PAA solution was homogeneously mixed with the NMP containing various amounts of γ-Al2O3. PI/γ-Al2O3 nanocomposite films with various amount of γ-Al2O3 were prepared by a thermal curing process. FE-SEM and TEM analyses showed that nanoscale γ-Al2O3 particles were well dispersed in PI/1～4wt.%γ-Al2O3 nanocomposite films, but some nanoscale γ-Al2O3 particles were aggregated in the PI/5wt.%γ-Al2O3 nanocomposite film. TGA and DMA analyses showed that the thermal degradation temperature, glass transition temperature, and storage modulus of the PI/4wt.%γ-Al2O3 nanocomposite film were higher than those of other nanocomposite films. TCA analysis showed that the thermal conductivities of nanocomposite films were increased with the amount of γ-Al2O3 increasing. Meanwhile, the tensile strength and elongation at break of the PI/4wt.%γ-Al2O3 nanocomposite film were higher than those of other nanocomposite films. Moisture absorption and dielectric constant of nanocomposite films were slightly increased with the amount of γ-Al2O3 increasing. The volume resistance and transparence of nanocomposite films were slightly decreased with the amount of γ-Al2O3 increasing.

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