Fabricaion of Low-Dielectric-Constant Hollow Polyimide Nanoparticles applicable to 5G Communication

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As the application of 5G mobile communication approaches, there is a growing demand for material technology with low dielectric properties. Polyimide (PI) is a promising material that is showing low dielectric constant and physically, chemically stable property. In this study, hollow PI nanoparticles are fabricated to maximize the low dielectric constant. The Reprecipitation method was employed for this synthesis, and subsequently imidized with blending a polymer to be placed in the core (polyvinylpyrrolidone, PVP) of individual nanoparticles. After chemical and thermal imidization, it was confirmed by infrared spectroscopy that the hollow nanoparticles are pure PI without mixing PI. This hollow structure is induced by microphase separation of PAA and PVP during reprecipitation process. The low dielectric constant of the synthesized nanoparticles were confirmed and thermogravimetric analysis confirmed that the nanoparticles were thermally stable up to 400°C. This strategy provide a new means for improving the low dielectric property for various interlayer dielectric materials.