



# ***PREPARATION AND CHARACTERIZATION OF POLYIMIDE/ORGANOCLAY NANOCOMPOSITES***

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## **Abstract**

The purpose of this research was to prepare nanocomposite materials comprised of exfoliated clay particles in a polyimide matrix. Poly(amide acid)/organoclay solutions and polyimide/organoclay films were prepared and the clay dispersion was characterized by visual inspection, XRD, and TEM. Mechanical measurements and certain thermal characterization measurements were also obtained. The research began by attempting to repeat the procedures set forth in the literature. Most of the polyimide/organoclay nanocomposites were being prepared by mixing prepared poly(amide acid) solutions with organoclay solutions. This simple mixing technology was used in the preparation of various polyimide/organoclay hybrid formulations. In-situ polymerization, which involved performing the polymer synthesis in the presence of the organoclay, replaced simple mixing with increased success. Although the in-situ polymerization technique was successful at exfoliating clay particles in certain polyimides, the organoclay degraded at the polyimide cure temperature. In order to raise the use temperature, the aliphatic surfactants found in commonly used organoclays were replaced with aromatic surfactants. The dispersion of the clay was more difficult with the aromatic surfactants. It was facilitated by reducing the charge on the clay surface. This was achieved by replacing some of the cations that reside on the surface of the clay particles with lithium ions in the interior of the particles. The in-situ polymerization of APB-BPDA poly(amide acid) in the presence of an aromatic organoclay with a cation exchange capacity (CEC) of 0.57 meq/g and subsequent cure to the polyimide yielded a film with a high level of clay dispersion.