

## **Study of the Relationship between Nanoparticles of Silica and Thermoplastic Polymer (TPU) in Nanocomposites**

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### **Abstract**

Nanosilicas with different silanol contents were obtained by treatment of hydrophilic fumed silica with dimethyldichlorosilane. This treatment reduced the silanol content and produced the particle agglomeration of the nanosilicas. Thermoplastic polyurethane (TPU) adhesives containing nanosilicas were prepared and characterized by FTIR spectroscopy, differential scanning calorimetry (DSC), plate-plate rheology, dynamic mechanical thermal analysis (DMTA) and transmission electron microscopy (TEM). It was demonstrated that addition of hydrophilic nanosilicas favored the degree of phase separation between the hard (i.e. isocyanate + chain extender) and soft (i.e. polyol) segments in the TPUs; the higher the silanol content on the surface of silica, the higher the degree of phase separation, and the crystallinity of the polyurethane (due to the soft segments) was also increased. Hydrogen bonds between the ester carbonyl groups in the TPU and the silanol groups on the silica surface were created and more favored by increasing the silanol content.

**Keywords:** silica, nanosilica, polyurethane, nanocomposites, and nanoparticle.

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