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SYNTHESIS OF FLEXIBLE POLYURETHANE NANOCOMPOSITE FOAM WITH ORGANOCLAY

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Flexible polyurethane (PU) nanocomposite foams were synthesized using organically modified montmorillonite clay (Cloisite 30B). The dispersion of organoclay was considered both in the isocyanate and polyol matrix. Silicate layers of organoclay can be exfoliated in the PU matrix by use of two step mixing process. Clay dispersion of samples was investigated by X-ray diffraction (XRD). As XRD pattern showed, the reaction of clay's OH groups and isocyanate's NCO groups is a driving force for separation of clay layers in the matrix. Thus, foams for which clay was dispersed first in the isocyanate show the better dispersion characteristic due to the affinity of OH groups on the clay surface to reaction with the NCO groups. The morphology and properties of PU nanocomposite foams also were studied. The presence of clay results in an increase in cell density and a reduction of cell size compared to pure PU foam. This occurrence is the result of the nucleation effect of nanoparticles. These particles facilitate the nucleation process and serve as nucleation sites in the foam matrix. Generally, mechanical properties by addition of clay were improved. Modulus increment is substantial by addition of organoclay. Thermo gravimetric analysis (TGA) of the samples has also studied and nearly same behavior between nanocomposites and pure foam in graph trend and transmission of the nanofoam's graph to the higher temperature was observed. The sample of the group which has the middle exfoliated structure shows the average best properties.