P-3-1049

THE EFFECTS OF ALUMINA NANOPARTICLE ON THE MECHANICAL PROPERTIES AND ABRASION WEAR RESISTANCE OF POLYURETHANE MATRIX

Amin Hooshafza, Fatollah Moztarzadeh, Mehdi Saboohi, Davood Bazregari, Mona Mahboob, Reza Chegeni,

Faculty of Biomedical engineering, Amirkabir University of Technology

anoom_2003@yahoo.com

Incorporating metal-oxide nanoparticles into polymer matrix to enhance mechanical properties is widely utilized in aerospace,marine,automobile and sports equipment applications. The aim of this research is to determine the reinforcing effects of alumina nanoparticles on a two-part polyurethane (PU) elastomer using solution mixing method for sport flooring application. A sonication technique was used to disperse the nanoalumina with the average size 30 nm into part-A of the Polyurethane followed by mechanical mixing into part-B and then the whole mixture was cast into prefabricated molds to make nanophased elastomer panels and cured in room temperature. Neat polyurethane and nanocomposite samples were later extracted from the panel to carry out morphological and mechanical characterizations. The effects of Al2O3 content on the tensile properties, hardness, skid and abrasion wear resistance were investigated. From the tensile test, both tensile strength and modulus were found to increase greatly with the content of Al2O3 nanoparticles. A British Pendulum tester was used to examine the skid resistance of neat polyurethane and nanocomposites, and "shore A" hardness was calculated by hardness measuring apparatus. Both skid resistance and hardness results have increased gradually. Abrasion tests were carried out on a Taber abrader machine. According to the results, it has been seen that the wear resistances of the nanocomposites improved significantly with the content of Al2O3 nanoparticles. Also, the fracture surfaces and abrasion area of the composites were analyzed with scanning electron microscope (SEM) and the tensile behavior, fracture and abrasion wear mechanism for the nanocomposites were discussed. In addition, a primitive conjecture about uniform dispersion of nanoalumina in polyurethane matrix was examined through the fracture surface SEM. Eventually,the SEM studies have shown that the particles are in nanosize range, non-agglomerate and well dispersed in the entire volume of the polyurethane matrix, which confirmed the fabrication method and ultrasonic technique efficiency.