



The effect of nano zinc oxide as an activator on the mechanical and thermal properties of Rubber Composite for Sukhoi Su-25 - Attack Aircraft Tyres

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Abstract: The research main idea is to design rubber composite that can be used in the aircraft (Sukhoi-Su-25) tires. This kind of aircraft tyres is demanded by the Iraqi Ministry of Defense. We successfully made in IRAQ. One of the goals of the research is to improve its qualifications to make it convenient to suit all hard circumstances that the aircraft tyres might expose which is unique to all other types of tyres. Also aims to preserve the environment through reducing pollution resulted from the use of great amounts of zinc oxide, which it uses an activator in rubber composite, by substitution of conventional Zinc Oxide by nano zinc oxide when producing of tyres. Pollution also takes place when we try to dispose the tyres of. Zinc oxide (ZnO) nanoparticles are synthesized by sol-gel method and tested by: X-Ray Diffraction Analysis (XRD), Atomic Force Microscopy (AFM), Scanning Electron Microscopy (SEM), Energy Dispersive X-Ray Spectroscopy (EDS), Fourier Transform Infrared Spectroscopy (FTIR). The cure characteristics, mechanical properties and thermal behaviour of natural rubber (NR and RSS1) systems containing nano ZnO are investigated and compared to those of (NR and RSS1) with micro-sized (conventional) ZnO. The RSS1 vulcanizate from aircraft tyre tread composite with 0.9 phr (parts per hundred parts of rubber) sol-gel derived nano ZnO shows improvement in the curing and mechanical properties in comparison to the RSS1 vulcanizate with 5 phr conventional ZnO. The ageing test and fatigue resistance test in 100°C reveals that nano ZnO imposes better thermal stability than conventional ZnO in the RSS1 vulcanizates. Thus, nano ZnO not only acts as a curing activator but also nano filler to improve the resulting properties of the RSS1 vulcanizates. nano ZnO leads to the reduction of ZnO level in the RSS1 composites. Therefore, sol-gel derived nano ZnO diminishes the pollution of aquatic environment due to higher amount of conventional ZnO in rubber composites.

Keywords: Sol-gel method, Nanostructured zinc oxide, Cure activator, Mechanical properties, Thermal stability.