DEGRADATION BEHAVIOUR OF NANO SILICA AND NANO TITANIA FILLED NATURAL RUBBER LATEX NANOCOMPOSITES

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Received: 01 August 2015 Accepted: 19 October 2015

Anand, K. Varghese, S. and Kurian, T. (2015). Degradation behaviour of nano silica and nano titania filled natural rubber latex nanacomposites. *Rubber Science*, 28 (3): 294-304.

The shelf-life of natural rubber latex products are highly dependent on various environmental factors. To improve the quality as well as performance, fine particle dispersions are employed in their formulations. The degradation behaviour of silica (SiO_2) and Titania (TiO_2) nanoparticles incorporated natural rubber latex (NR) nanocomposites against various degrading agents *viz.* thermal, γ-radiation, UV radiation and chlorination were studied. The properties such as tensile strength, elongation at break and modulus were recorded after exposing the latex films to various degrading environments. Compared to the gum vulcanizates, addition of nano SiO_2 and nano TiO_2 improved the tensile strength even after ageing. Enhanced UV resistant properties were noticed for nano titania latex composites from mechanical property measurements. Nano SiO_2 (0.3 phr) imparted maximum tensile strength after chlorination.

Keywords: Degradation, Mechanical properties, Nano SiO_2, Nano TiO_2, Natural rubber, UV radiation

INTRODUCTION

Natural rubber (NR) exhibits unique mechanical properties due to highly stereo regular microstructure resulting from its high molecular weight (Wang, 1998). However, its resistance to heat, oxygen and ozone is poor due to the presence of large number of double bonds in the chemical structure (Nwanorkh and Enyiegbulam, 1998). Degradation of NR can be affected by a variety of factors such as elevated temperatures, light, humidity, impurities, radiation, chemicals *etc.* The shelf-life of rubber products are dependent on such environmental factors.

Natural rubber on prolonged exposure to heat undergoes thermo-oxidative degradation, which in turn adversely affect the properties. When NR products are exposed to UV radiation, free radicals are produced. These free radicals abstract H atom from poly-isoprene chains thereby producing more free radical sites in the chain. These alkyl free radicals react with oxygen in atmospheric air to produce hydroperoxides. The free radical chain reaction process continues until entire rubber gets degraded (Peethambaran and Kuriakose, 1989). Light ageing in rubber can be retarded by adding UV resistant materials

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