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A STUDY OF THE FLOW BEHAVIOUR OF NATURAL RUBBER LATEX/ SINGLEWALLED CARBON NANOTUBES BLENDS USING ROTATIONAL VISCOMETRY AND POWER LAW MODEL

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The physiochemical modification of natural rubber latex (NRL) is achieved via the addition of finely dispersed reinforcing fillers (RFs) and chemical ingredients. In recent times, single walled carbon nanotubes (SWCNT) have shown great prospect as a suitable RF for NRL even at very low loadings; compared to conventional RFs such as carbon black and fine particle clays. Although SWCNT are generally insoluble in water, optimized dispersions are often prepared via various physiochemical treatments which promotes the exfoliation of the otherwise entangled SWCNT. Chemical modification (covalent methods) involves the introduction of functional groups on the surfaces of SWCNT. Whereas, physical treatment (non-covalent methods) often utilise surfactant systems with a relatively high Hydrophilic-lipophilic balance (HLB). It is thus pertinent to elucidate how the incorporation of dispersed SWCNT affects the flow behaviour of NRL. This is because, the flow behaviour of NRL plays a huge role during storage, handling and processing. In this work, the flow behaviour of NRL/SWCNT blends prepared via the latex stage mix method have been investigated. Flow behaviour was studied according to the principles of rotational viscometry on a Modular Compact Rheometer (MCR) fitted with a concentric cylinder geometric measuring system. The experimental conditions involved the exposure of blends to varying shear rates (0.1 –100 s-1) at three isothermal temperatures (25, 30 and 35°C); this was based on the probable conditions during storage, handling and processing of rubber lattices. Results obtained revealed high apparent viscosity at low shear rates for samples with higher loadings of SWCNTs. For Instance, viscosity at 25°C and 1 s-1 of blends with 0.08% SWCNT was 2.5 Pa.s whilst that with 0.02% loading 0.49 Pa.s. Again, characteristic shear thinning behaviour was observed, which was confirmed by the power law model fits.

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