

# Nanocomposites and nanomaterials

## Study of tribological properties of natural rubber containing carbon nanotubes and carbon black as a hybrid fillers

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Carbon nanotubes (CNTs) have been receiving a lot of attention in the research community due to their outstanding electrical and mechanical properties. High flexibility place them between a promising materials for flexible electrical devices and solid lubrication in tribological applications.

Rubber/carbon nanotube composites show the advantageous mechanical properties due to structural characteristics of carbon nanotubes like their high aspect ratio, high surface area which lead to higher kinetic energy dissipation as well as their exceptionally high Young's modulus. Several studies have attested the ability of CNTs to reduce friction and wear when used as the fillers in composites. Although all these systems show improvements of mechanical characteristics, the tribo-mechanism differ from case to case and still raise a lot of questions.

The main disadvantage of CNTs is their processing difficulty due to strong van der Waals interaction that generates agglomerates. This problem can be partially solved by preparation of rubber composites with hybrid CNTs and carbon black (CB) fillers.

In the present work, natural rubber (NR) based composite containing a fixed amount (30 phr) of hybrid fillers in which the CNTs was taken at 0, 0.5, 1.0, 3.0, and 5.0 phr for different samples were prepared. The main goal was to study the behavior of NR/CNTs+CB composites at different tribological testing parameters such as friction speed and load.

Coefficient of Friction (COF) and wear displayed essential decrease as a function of CNT concentration in the investigated samples. Simultaneously, an increase in the elastic modulus and hardness was observed.