

TITLE	PROPERTIES OF NATURAL RUBBER AND STYRENE BUTADIENE RUBBER FILLED WITH CARBON NANOTUBE AND CARBON NANOTUBE / CARBON BLACK
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ABSTRACT	<p>In this research, various amounts of carbon nanotube (CNT) were incorporated into natural rubber (NR) and styrene butadiene rubber (SBR) with and without the presence of carbon black (CB). The mechanical properties, abrasion behavior, and cut growth behavior of NR and SBR vulcanizates filled with CNT (NC and SC) were compared with those of NR and SBR vulcanizates filled with CNT/CB hybrid filler (NH and SH). In addition, the tensile and tear specimens were cut from the vulcanized sheets in machine direction (MD) and transverse direction (TD) in order to study the effect of milling direction on their tear strength and tensile properties. The results reveal that hardness, modulus, and compression set of the NC, SC, NH and SH increase with increasing CNT content, while their elongation at break decreases. Additionally, tensile and tear strengths of the SC increase with increasing CNT content. Contrarily, the NC shows improvement only in tear strength with increasing CNT content while their tensile strength increases up to 2 phr of CNT and then decreases continuously with further increase of CNT content. Moreover, tensile and tear strengths of the NH and SH do not significantly change when CNT content is increased. HIM images clearly show that the CNT agglomerates are formed in both NC and SC, and they cause the reduction in tensile strength of the NC. On the contrary, good dispersion of the entangled CNTs with CB aggregates and agglomerates inserting in their interstitial spaces are observed in both SH and NH. In addition, the difference in milling direction does not affect the tensile and tear strengths of all vulcanizates. However, it produces the NC and NH with higher modulus and lower elongation at break in MD than their corresponding TD samples. The results also show that abrasion resistance of the NC and SC improves with increasing CNT content whereas that of the NH and SH does not significantly change. Furthermore, the improvement of abrasion resistance of the NC and SC corresponds well with the reduction of the ridge spacing on their abraded surfaces. Cut tensile strength (CTS) and relative cut tensile strength (relative CTS) of the SC, NH, and SH increase when CNT content is increased while those of the NC show the opposite trend. The enhancement of CTS and relative CTS with increasing CNT content for the NH corresponds to its greater degree of longitudinal cracking prior to catastrophic fracture.</p>