

PERFORMANCE OF SURFACE MODIFIED CLAYS IN NATURAL RUBBER COMPOUNDS

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Natural rubber compounds containing different modified clays were evaluated for their processing and technological properties. The amino and mercapto silane modified compounds had higher modulus and abrasion resistance and lower compression set. Flex cracking resistance was more when mercapto silane modified filler was used and hence this was rated as superior modification for clay to be used in natural rubber compounds.

Key words: Fillers, Natural rubber compounds, Modified clay.

Fillers are incorporated into polymers for reinforcement, abrasion resistance, electrical resistance, improved processability or cost reduction. Mineral fillers like carbonates, clays, silicas and talc are used in rubber industry to extend and/or reinforce elastomers. Kaolin clay, a hydrated aluminium silicate, is one such mineral abundant in India. It has the finest particle size range among all naturally occurring minerals (Stoy and Washabaugh, 1987). Clays have been used as filler in compounding of rubbers as an extender and the relatively inferior properties of the resulting vulcanizates are accepted in consideration of lower cost and processability. Clay has been the predominant non-black filler of choice in the inner and white sidewall compounds. Clay has also been used in rubber lubricant and tyre sealant formulations (Waddel, 1996). The surface properties of clays cause difficulties in their use as a reinforcing agent, particularly in hydrocarbon rubbers (Dannenberg, 1975).

The filler surface is highly polar and hydrophilic as a result of its polysiloxane structure and the presence of numerous silanol groups. The large quantity of adsorbed moisture in clay adds to the difficulty in rapid wetting and dispersion in rubber. Physical moisture content is almost impossible to control due to the strong desiccant nature and the release of moisture during mixing with rubber at elevated temperature. Compounding recipes are developed using glycols, which decrease their influence on the vulcanization reactions by hydrogen bonding and blocking of the hydroxyl groups. Altering the surface nature of the clays by other techniques like heat treatment, coating or surface modification can enhance their performance in elastomers. By modification, the clay particles can be made to disperse individually in the polymer matrix and thus improve the dispersion level and processability. Recent advances in the chemistry and processing of clay has led to the