

## EPOXIDISED NATURAL RUBBER: A MODIFIER FOR CHINA CLAY FILLED NITRILE RUBBER

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China clay, a semi-reinforcing filler is used for rubber products which do not require very high mechanical properties. Silane coupling agents or activators like diethylene glycol (DEG) are used in such formulations to enhance the polymer filler interaction. The use of small proportions of ENR as reinforcement modifier in china clay filled NBR was attempted and was compared with activator and silane coupling agent. Cure characteristics changed with the addition of all the three modifiers. ENR and silane modified systems showed better modulus, strength and other physical properties indicating better polymer-polymer and polymer-filler interactions. ENR-substituted composites also exhibited ageing resistance comparable to that realised with the coupling agent. For the composites containing china clay and ISAF black, ENR substitution reduced the cure time and improved the tensile and tear strength, though the values were lower than those containing the coupling agent. The overall property enhancement indicated that ENR can function as a reinforcement modifier in china clay filled nitrile rubber.

**Key words:** China clay, Epoxidised natural rubber, Nitrile rubber, Reinforcement modifier.

### INTRODUCTION

Nitrile rubber (NBR), which remains amorphous under all conditions, requires the use of reinforcing fillers in the manufacture of products that need good mechanical properties. Hydrated silica imparts better physical properties to polar rubbers, compared to hydrocarbon rubbers. Kaoline clay, also called kaolinite or china clay, (Waddell and Evans, 2001; Florea, 1986) is hydrous aluminium silicate  $[Al_2Si_2O_5(OH)_4]$ , consisting of platelets with alternating layers of silica and alumina. Clays have been used as fillers (extenders) in compounding of rubbers

as they are relatively cheap although the resulting vulcanizates have inferior properties. The clay filled compounds have better processability but the surface properties of clays cause difficulties in their use as a reinforcing agent 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. Generally a silane coupling agent (Si 69) or an activator like diethylene glycol (DEG) is used to enhance polymer-filler interaction and thereby the level of reinforcement (Murakami *et al.*, 1999).