

**EFFECT OF BIS-(3-TRIETHOXYSLYLPROPYL)-  
TETRASULFIDE AND POLYETHYLENE GLYCOL  
ON THE PROPERTIES OF NATURAL RUBBER/  
MICA COMPOSITE**

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## ABSTRACT

The bis-(3-triethoxysilylpropyl)-tetrasulfane (Si69) is widely applied as a coupling agent to rubber-filler interactions in silica filled rubber composites. In this study, the effect of bis-(3-triethoxysilylpropyl)-tetrasulfane (Si69) and polyethylene glycol (PEG) on the properties of natural rubber (NR)/mica composites has been studied. Mica is one of the widely available silica-containing minerals in Sri Lanka. The effect of Si69 and PEG on the properties of natural rubber (NR)/mica composites have been observed while keeping the mica loading constant (30 phr). By keeping the total weight of Si69/PEG at 2 phr, the ratios of the Si69: PEG were changed as 0:1 (SP01), 1:0 (SP10), and 1:1 (SP11). The composite free from Si69/PEG (SP00) was considered as the control. SP10 recorded the highest cure time ( $T_{c90}$ ) and scorch time ( $T_{S2}$ ). The introduction of PEG has reduced cure time ( $T_{c90}$ ) and scorch time ( $T_{S2}$ ) in SP01 and SP11, which are comparable with the control. Higher tensile strength emphasized better rubber-filler interactions in the composites with Si69 (SP10 and SP11). Although, SP10 recorded the highest elongation at break, SP11 resulted the enhanced moduli at 100%, 300%, and 500% elongation, showing better rubber-filler interactions than SP10. This further supports the hardness and resilience data, of which SP11 yielded the highest hardness and resilience values. Thermal aging results showed enhanced tensile strengths in SP00 and SP10, which may be attributed to the formation of more crosslinks. PEG could increase the viscosity of rubber causing permanent heat deformation, thus resulting inferior tensile aging results in the SP01 and SP11. The thermogravimetric analysis revealed that Si69 and PEG have no significant effect on the degradation of composites. The highest swelling ratio was exhibited by SP01. Overall results specified that the use of Si69 with PEG may be more effective and have optimized overall properties of NR/mica composites.

*Keywords:* Coupling agent, Mica, Natural rubber composites, Polyethylene glycol