

## **A comparative study on curing characteristics, mechanical properties, swelling behavior, thermal stability, and Morphology of feldspar and silica in SMR L vulcanizates**

### **Abstract**

Comparison studies on effects of feldspar and silica (Vulcasil C) as a filler in (SMR L grade natural rubber) vulcanizates on curing characteristics, mechanical properties, swelling behavior, thermal analysis, and morphology were examined. The incorporation of both fillers increases the scorch time,  $t_2$ , and cure time,  $t_{90}$ , of SMR L vulcanizates. At a similar filler loading, feldspar exhibited longer  $t_2$  and  $t_{90}$  but lower values of maximum torque,  $M_{HR}$ , and torque difference,  $M_{HR}-M_L$  than did silica-filled SMR L vulcanizates. For mechanical properties, both fillers were found to be effective in enhancing the tensile strength (up to 10 phr), tensile modulus, and hardness of the vulcanizates. However, feldspar-filled SMR L vulcanizates showed lower values of mechanical properties than did silica-filled SMR L vulcanizates. Swelling measurement indicates that swelling percentages of both fillers-filled SMR L vulcanizates decrease with increasing filler loading whereas silica shows a lower swelling percentage than feldspar-filled SMR L vulcanizates. Scanning electron microscopy (SEM) on fracture surface of tensile samples showed poor filler–matrix adhesion for both fillers with increasing filler loading in the vulcanizates. However, feldspar-filled SMR L vulcanizates showed poorer filler–matrix adhesion than did silica-filled SMR L vulcanizates. Thermogravimetric analysis (TGA) results indicate that the feldspar-filled SMR L vulcanizates have higher thermal stability than do silica-filled SMR L vulcanizates.

**Keywords**—Feldspar, silica, curing characteristics, mechanical properties, swelling behavior, thermal analysis, morphology, SMR L vulcanizates.