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WEERAPEN SITTICHOKCHUCHAI: INFLUENCES OF STATE-OF-MIX ON RHEOLOGICAL, MECHANICAL AND DYNAMIC PROPERTIES IN SBR COMPOUNDS. THESIS ADVISORS: CHAKRIT SIRISINHA, Ph.D., KRISDA SUCHIVA, Ph.D., PRANEE PHINYOCHEEP, Doctorat de l' Universite' du Maine.109 p. ISBN 974-663-762-2

The state-of-mix determined from the effective filler volume fraction (EFVF) based on an estimate of the amount of immobilized rubber in the carbon black agglomerates has been shown to influence significantly the extrudate swell. Therefore, this study is divided into two parts. The first part investigates the influences of state-of-mix on rheological, tensile, dynamic properties and bound rubber content are studied in black-filled SBR compounds with curing agents. The state-of-mix was evaluated using various techniques including capillary rheometer, tensometer and DMA. It was found that as state-of-mix increases, shear viscosity remarkably decreases whilst the extrudate swell increases. Both tensile and dynamic properties were slightly dependent on state-of-mix. Unexpectedly, bound rubber decreases with increasing mixing time. From the results obtained, it is conclusive that a concept of a decrease in effective filler volume fraction (EFVF) as the state-of-mix increases, due to a release of immobilized rubber, is applicable to the system studied. For recommendation, the study investigates effects of filler types and rubber types.

In the second part, the effects of some processing aids (processing oil, stearic acid, slipping agent and homogenizing resins) on EFVF using capillary rheometer technique were also investigated. The effects of the oil and stearic acid at high concentrations on extrudate swell are dominated strongly by the plasticizing effect. As the concentration is increased, extrudate swell decreases due to the reduction in stress for filler disagglomeration during mixing and thus the increase in EFVF. In contrast, effect of the homogenizing resins on extrudate swell is dominated strongly by the dilution effect, resulting in a decrease in EFVF and thus an increase in extrudate swell. Finally, the decreased extrudate swell with increasing Struktol WB 16 was mainly attributed to the effect of wall slip. Results of the present study have shown that EFVF can be controlled to types and concentrations of processing aid. Further investigation into the effects of processing aid types is recommended.