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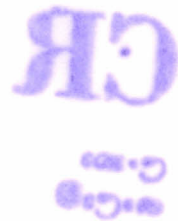
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# **Cross-linking by sulphur monochloride of modified butyl rubber in solution.**

By

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## ABSTRACT

Natural rubber can be vulcanised by sulphur. However butyl rubber, which is a copolymer containing isobutylene and isoprene units, requires very powerful accelerators to be vulcanised. This project is an alternative procedure to effect cross-linking of butyl rubber. It does not involve an accelerator and proceeds easily at room temperature in solution in an organic solvent using sulphur monochloride ( $S_2Cl_2$ ) as cross-linking agent. Butyl rubber having a low content of isoprene units was dissolved in toluene and various amounts of  $S_2Cl_2$  were added with stirring.

The effect of reaction time on conversion to insoluble cross-linked material was examined and the gel was characterized with respect to the subsequent equilibrium degree of swelling in organic solvents and with respect to elastic properties using compression strain. The swelling capacity of the gels in toluene or cyclohexane increased with decreasing concentration of sulphur monochloride. Cyclohexane found to be a better solvent than toluene for swelling.

The swelling ratio of the gels prepared at a fixed concentration of  $S_2Cl_2$  first increased rapidly with increasing swelling time, but then decreased until an equilibrium was obtained, for gels prepared at medium – high concentrations of  $S_2Cl_2$ . For those prepared at low concentration of  $S_2Cl_2$  swelling proceeded to an equilibrium level which remain constant.

This unusual swelling behaviour was accompanied with an increase of the elastic moduli of the gels during the swelling process. The results were explained with the post cross-linking reactions taking place during the swelling process of PIB gels.

Increases content of isoprene in the butyl rubber gave site to corresponding increases in effective cross-linking density, elastic moduli, and polymer solvent interaction parameter. The weight fraction of solvent become high when the butyl rubber contains less isoprene units.

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