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STUDIES ON NATURAL RUBBER - SHORT SISAL FIBRE COMPOSITES

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Effects of chemical treatment, aspect ratio and concentration of fibre and type of bonding system on the properties of natural rubber – short sisal fibre composites were evaluated. The results indicated that acetylation of sisal fibre improved the properties of the composites. Aspect ratio in the range of 20-60 was found to be sufficient for reinforcement. A minimum of 12 per cent (v/v) loading of the acetylated fibre was necessary for proper reinforcement. A two-component system consisting of resorcinol and hexamethylenetetramine was found to be better than the normal tricomponent bonding system consisting of resorcinol, hexamethylenetetramine and hydrated silica.

Key words:—Natural rubber, Sisal fibre, Short fibre, Composites, Dry bonding system, Reinforcement, Aspect ratio, Adhesion.

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INTRODUCTION

Reinforcement of elastomers with short fibres combines the rigidity of the fibre with the elasticity of rubber. The resulting composites are used in many applications, especially in hose and V-belts. They present the additional benefit that the fibre is incorporated in the compound as one of the ingredients of the receipe (Ibarra and Chamorro, 1989) and hence, they are amenable to the standard rubber processing steps of extrusion, calendering and various types of moulding. Large volume outputs of short fibre composites are thus feasible. Short fibres are also used to improve or modify certain thermodynamic properties of the matrix for specific applications, or to reduce the cost of fabricated articles (Hamed and Coran, 1978). The properties and performance of short fibre reinforced rubber composites depend mainly on: (a) concentration and type of fibre; (b) aspect ratio of fibre after mixing; (c) orientation of the fibre after mixing; and (d) degree of adhesion of the fibre to the rubber matrix. Various fibres such as glass, rayon, nylon, asbestos, aramid and cellulose have been studied as reinforcement in both natural and synthetic rubber matrices (O' Connor, 1977 and Coran *et al.*, 1976). Jute fibre and waste silk fibre as reinforcing fillers for natural rubber (NR) have also been investigated by Chakraborthy *et al.* (1982) and Setua and De (1984) respectively. The use of coconut fibre as reinforcing filler for rubber has been reported recently (Arumugam *et al.*, 1989).

Results of investigations on the cure characteristics and mechanical properties of NR reinforced with short sisal fibre