

USE OF VARIATIONAL PRINCIPLE IN STRESS ANALYSIS
OF RUBBER IN STRESS RELAXATION SITUATIONS

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Due to the entropic nature of rubber elasticity, the stress-strain behaviour of the rubber-like state is obtained by considering the single chain conformational statistics and the cumulative strain energy of chains in the whole network. Therefore, stress analysis problems of rubber can easily be formulated using the variational principle to minimise the total potential energy of the whole body subjected to a given type of deformation.

In this paper a finite difference method is discussed to study the stresses generated when a cylindrical rubber button is maintained at a fixed compression. The application of this method in situations where stress relaxation occurs by simultaneous rupture and reformation of molecular chains, shows that the force exerted by the specimen does have a considerable influence by newly formed crosslinks due to the progressively changing gross deformation, showing a reduction in apparent rate of stress relaxation.