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KINETICS OF ELASTIC FILM FORMATION AT THE AIR/WATER INTERFACE

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The surface rheology of acacia at the air-water interface shows a time dependent increase in surface shear elastic modulus (G's), consistent with a saturable adsorbed surface excess. This increase in G's is not accurately represented by second order coagulation kinetics, as appropriate for interacting polymer segments. (Carlin et al 1989).

G's kinetics over several hours, at four bulk concentrations, are shown as the dotted curves in Figure 1. After 4 hours the rate of increase is linear and appears to be independent of bulk concentration. The mean gradient can be used to subtract the time dependent component from the higher concentration curves, which then reach a limiting value (as per coagulation theory) of approximately 12mN/m. This value corresponds to the elastic modulus at fresh surfaces of concentrated acacia solutions. Linearity is consistent with the net effect of irreversible diffusion to surface (proportional to root time) and second order coagulation. The time lag before elastic film formation at lower bulk concentrations indicates a minimum surface excess must first occur, (diffusion limited at lower concentrations). Surface viscosity measurements should reflect the build up of molecules at the surface, but proved too dependent on the predominant elastic effects.

A higher pH should increase intermolecular repulsion of a polyanion such as acacia, reducing G's. Figure 2 shows that the surface elasticity of a 0.1% aqueous solution is eliminated by adding NaOH and, conversely, strengthened by adding HCl. The addition of a bifunctional base such as piperazine, to cross-link the acacia, also increases the surface elasticity. This is consistent with use of piperazine arabate, (from the interfacial reaction between acacia and the base), as a novel microcapsule wall former. (Sundararajan and Speaker, 1990).

Fig.1

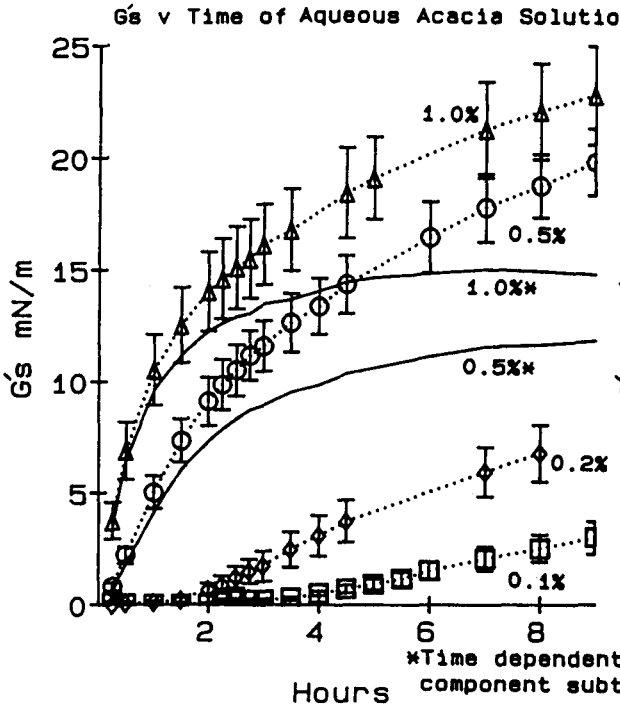
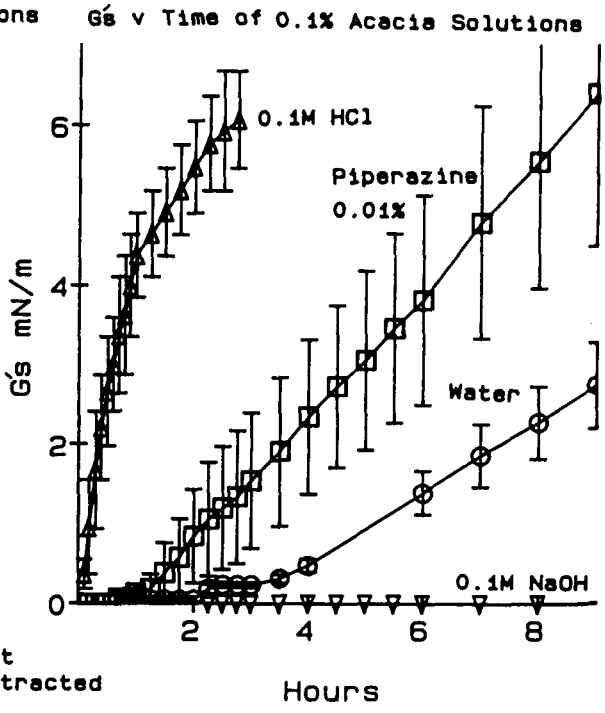


Fig.2



Carlin, B.A. et al (1989) J.Pharm.Pharmacol. 41: 105P
Sundararajan, M.R., Speaker, T.J (1990) Proc. 7th Int. Symposium on Microencapsulation, Univ. of Strathclyde. In press.