THE USE OF OSCILLATORY SURFACE SHEAR RHEOMETRY IN PHYSICAL PHARMACY AND PHYSICAL BIOCHEMISTRY

H.R.Blackmore and B.Warburton, Department of Pharmaceutics, The School of Pharmacy, 29-39 Brunswick Square, London, WC1N 1AX.

Introduction Oil-in-water emulsions stabilised by polysaccharides and proteins have been studied extensively by rheological methods at the interface (Shotton et al 1961, 1963, 1967).

Films of the macromolecules which are viscoelastic solid in nature at the oil-water or air-water interface disclose the fact that permanent secondary force cross-links are being formed.

The rate of formation of cross-links can be correctly expressed as the half-time of formation of all possible links since the cross-linking process has been shown to be a second order chemical kinetic process obeying the Warburton-von Smoluchowski relation (Warburton 1978).

The rate of formation of cross-links is comparatively slow as can be seen for the following solutions of 2% W/v potassium arabate against air:-

pH	6.0	5.5	4.5	3.4
$T_{\frac{1}{2}}$ seconds	1250	222	125	<60

A second application of oscillatory surface shear rheometry is the amplification of the immune response of Limmulus amoebocyte lysate to E.coli endotoxin at very low concentrations. This can lead to a continuous monitoring test for pyrogens In water.

The apparatus has developed in stages (Sherriff and Warburton 1974, 1975, Warburton 1976, 1978) and in the present form the balancing or control of normalised resonance is achieved automatically. Future developments simplify the use of the equipment by using a microprocessor to drive the rheometer measuring head. A suitable microprocessor is the National Semiconductor SC/MP which will replace most of the existing electronic circuits.

The demonstration will show the results obtained for the surface coagulation kinetics of 2%W/v potassium arabate solution over a range of pH, and the amplification of an immunological process: the reaction of Limmulus amoebocyte preparation with 15µg/ml standard endotoxin solution.

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