

## THE ELECTROPHORETIC BEHAVIOUR OF PARTICLES STABILIZED BY HYDROPHILIC POLYMERS

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The microelectrophoretic examination of suspended drug particles has been used extensively to study the influence of surface adsorbed adjuvants on the zeta potential. In this work, the effect of various molecular weight fractions of polyvinylpyrrolidone (PVP), sodium carboxymethylcellulose (SCMC), hydroxypropylmethylcellulose (HPMC) and acid and alkaline processed gelatins, on the electrophoretic mobility of a polystyrene latex and sulphadimidine particles has been examined. Mobilities were measured at 25<sup>o</sup> in the cylindrical cell of a Rank Mark II microelectrophoresis apparatus.

The latex particles were prepared according to the method of Chung-li and others (1976), and were 3.5  $\mu\text{m}$  in diameter. The mobilities were determined over the pH range 3-10, and the pH-mobility profile was similar to that reported by Ottewill and Shaw (1967). The surface charge densities were determined from conductometric and potentiometric titrations. PVP addition resulted in reduced mobility, with partial suppression of the charge due to the surface sulphate and carboxyl groups. SCMC imparted a greater negative mobility to the latex due to the carboxyl groups of the adsorbed polymer. Maximum mobility was observed in the range pH 6-7. HPMC adsorption resulted in low negative mobility which was independent of pH. The mobility of the latex with adsorbed gelatin was determined by the ionization of the constituent amino acids and estimates of the gelatins isoelectric points could be made from the mobility-pH curves. As previously noted (Robinson & others, 1975) the alkaline samples resulted in higher mobility than the acid, suggesting greater net molecular charge. Where evident, there was no shift in the pH associated with the ionization of surface carboxyl groups on the adsorption of polymers.

Sulphadimidine particles produced a sigmoidal mobility-pH curve, although solubility at high and low pH prevented the examination of an extended pH range. The pH of zero mobility (4.4) was lowered by PVP adsorption; a greater lowering being achieved with higher molecular weight fractions. Two 'steps' were noted in the curve above pH 5.0, which can be attributed to pH dependent ion adsorption. PVP reduced the positive surface charge more effectively than the negative and hence flocculation would probably be more readily achieved in acidic conditions. Adsorption of SCMC and gelatin both resulted in curves similar to those achieved with latex, indicating that these polymers impart surface characteristics dominated by the ionized groups of the polymer which are sufficient to mask the original surface charged groups.

The pH of minimum surface charge was selected for PVP and gelatin for studies of flocculation behaviour. Even at this pH, it was found that flocculation was concentration dependent. For example when sulphadimidine was stabilized by PVP, then an optimum concentration ( $10^{-6}$  w/v) for flocculation was observed for all grades of PVP.

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Ottewill, R.H. & Shaw, J.N. (1967). *Kolloid-Zus. Polymere.*, 218, 34-40.

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