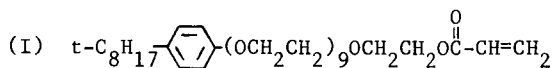


A POLYMERIZABLE NON-IONIC SURFACTANT FROM TRITON X-100

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Novel means of forming polymeric microspheres are of interest in the search for new drug-polymer systems. Attempts have been made in this laboratory to polymerise polyoxyethylene alkyl ethers in micellar form by subjecting aqueous solutions to cobalt-60 sources. γ -irradiation cross-links polyoxyethylene glycols in aqueous solution (Stafford, 1970) but so far the effect of irradiation of non-ionic surfactant solutions has been to degrade the hydrophilic chains causing chain scission and to increase the hydrophobicity of the monomers. An alternative route to polymerised micelles is by way of a polymerisable amphipathic monomer. Kammer & Elias (1972) formed monomers with a reactive hydrophobic group. Birrenbach & Speiser (1976) have reported on the formation of 'nano-capsules' by incorporating a reactive monomer in micelles. We have prepared an acryloyl derivative of Triton X-100 by reacting the parent compound in dry benzene with acryloyl chloride using pyrogallol as a catalyst and triethylamine as scavenger for HCl formed. *p*-Methoxyphenol is added to the filtrate after reaction has ceased to stabilise the reactive molecule. The monomer is purified by washing with HCl, passing through a column of alumina to remove acrylate impurity and then through silica to remove unreacted Triton. The product (I) has the structure shown below, confirmed by n.m.r. and i.r. spectroscopy.



The physical properties of this compound have been studied prior to extensive investigation of its reactive potential. Surface tension of aqueous solutions of the compound I indicate that the critical micelle concentration has fallen from 0.014% to 0.0056% (8.2×10^{-5} M). The area per molecule is 87\AA^2 compared with 75\AA^2 for Triton X-100. The intrinsic viscosity at 5.6° is 3.0 ml g^{-1} , a decrease from 4.6 ml g^{-1} for the unmodified surfactant, illustrating the importance of the terminal hydroxyl group in determining the hydration of the micellar form. As expected from the above changes, the cloud point of the compound is decreased, being $13 - 14^\circ\text{C}$, 53 degrees lower than that of the parent compound.

Polymerisation of I can be initiated by γ -irradiation and by addition of ferrous sulphate and potassium persulphate. The polymer precipitates from aqueous solution when polymerisation is induced in a 2% 50:50 mixture of Triton X-100 and I. The intrinsic viscosity of the insoluble fraction in toluene is $\sim 30 \text{ ml g}^{-1}$ and light scattering studies on the initially formed suspensions suggest a molecular weight of the order of millions. So far there is no evidence of individual polymerised micelles but examination of the aqueous filtrate from the precipitated system confirms the presence of soluble polymer.

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