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Study on the Polyoxyalkylenic Nonionic Surface Active Agents

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To make some oxyethylene ethers of alcohols and phenols, which have definite chain lengths; mono-, di-, tri-, tetra and penta oxyethylene lauryl, myristyl, cetyl, oleyl and nonylphenyl ethers, potassium or sodium alcoholates were reacted with low polyethyleneglycol chlorohydrings (mono- ~ penta-), and the surface tension of those ethers' solutions was measured.

A certain amount of ethyleneoxide was added to 1 mol of ethylene chlorohydrin with stirring and keeping cool, then catalyst was added and the mixture was polymerized under a certain temperature. After the removal of undissolved salts from the neutralized solution with K_2CO_3, the filtrate was distilled in vacuo to obtain low polyethyleneglycol chlorohydrins. In the preparation of low polyethyleneglycol chlorohydrins, variations and concentration of catalysis, mol ratio of ethylenechlorohydrin to ethyleneoxide and temperature of reaction were studied, and the optimum condition was determined.

At the same time, the products of reaction with ethylenechlorohydrin and propyleneoxide were studied also.

Nextly oxyethylene ethers of alcohols and phenols were prepared as follow : an equivalent amount of K or Na was added to lauryl, myristyl, cetyl, oleyl alcohol and nonylphenol in toluene or without solvent. The temperature of the mixture was kept at 110—120°C for 20—40 hrs to complete the reaction. After removing the solvent, the excess of mono~pentaethyleneglycol chlorohydrin was added to the alcoholate or phenolate and the reaction mixture was stirred at 110—120°C for about 30 hrs. Then KCl or NaCl was removed by filtration. From the filtrates the ethers were obtained by fractional distillation, molecular distillation and/or recrystallization. The purity was confirmed by elementary analysis, molecular weight and infrared analysis. Also, their melting points, refractive indices and specific gravities were tabulated.

These ethers were disolved or suspended in water and the surface tension of their solutions was measured by du Noüy's surface tension meter. With the exception of cetyl ethers mono~tetraoxyethylene myristyl ethers and mono and dioxyethylene lauryl ethers, the surface tension vs. logarithm of concentration curves of the solutions showed same characteristics as those of ordinary surface

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active agents, namely c. m. c. was indicated by the sharp break in the curve.

Furthermore, it was shown that the surface tension of the solutions of paired ethers containing lauryl-oleyl oleyl-nonylphenyl and nonylphenyl-lauryl, having tetraoxyethylene chain respectively was between those of individuals of each ethers. Exploratory experiments were also carried out with other combinations.