STRUCTURE AND WETTABILITY OF METHACRYLIC POLYMERS WITH FLUORINATED SIDE CHAINS

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Surface properties of methacrylic homopolymers and copolymers with a random distribution of pendant perfluorinated groups $R_F = C_nF_{2n+1}$ have been studied. These polymers are obtained by radical polymerization in solution or emulsion of fluorinated monomers (M_F) $CH_2 = C (CH_3) CO_2 (CH_2)_2 R_F$ with various hydrogenated comonomers (M_H). Surface tensions are estimated according to the length of R_F groups (n = 4, 6, 8), the fluoromonomer concentration [M_F] in copolymers and the chemical structure of comonomers M_H (MMA, BMA ...), by different methods: Zisman's (γ_C), geometric and harmonic mean approximation.

Wettability measurements can provide useful information about the structure of polymeric surfaces. The tensiometric method used for wetting measurements reveals an abnormally large hysteresis effect between advancing and receding contact angles when the polymer surface is in contact with water. This effect is markedly decreased by the length of the R_F group from n = 4 or 6 to 8 and by the concentration of fluoromonomer units in copolymers. The evolution of the surface properties of the polymer in contact with a polar liquid (water) can be explained by the reorganization and the reorientation of hydrophilic moieties of the macromolecules at the interface. At the polymer - air interface the fluorinated chain packing control the surface wettability. Hydrophilic ester groups of methacrylic units are buried in the bulk of the polymer, thus the polymer surface is different from its bulk. The evolution of surface energy cannot be explained by adsorption or absorption of water.

A study by DSC has therefore been undertaken to correlate hysteresis with the potential organization of R_F groups at the polymer - liquid interface and crystallinity of fluoropolymers.