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The Impact of Polyacrylamide Molecular Weight on Its Adsorption Behavior at the Gold/Acidic Solution Interface

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Abstract: Adsorption isotherms for polyacrylamide (PAA) on polycrystalline gold, from sulfuric acid (potential range 0-2.0 V/she; 293 K), were obtained by means of cyclic voltammetry with simultaneous monitoring of the double-layer capacity. The Frumkin isotherm indicates that relatively strong attractive forces are present (a = 0.8-1.0), and the Gibbs energies range between 43 and 56 kJ mol^{-1}. The coverage (θ) of the metal surface with polymer molecules depends on the molar concentration of PAA, as well as on its molecular weight, and the size of the statistical polymer coil in the solution (R_G = 7.49 \times 10^{-3} \times $M_n^{0.64}$/nm). The adsorption coefficient B also strongly depends on the polymer molecular weight (B = k M_n^{α}), indicating, once more, that the size of the polymer coil and its conformation at the metal surface and/or in solution are the main factors determining the polymer adsorption at the metal/solution interface.

Key Words: Electrosorption, polyacrylamide, polycrystalline gold, adsorption isotherms, radius of gyration

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