KINETIC STUDIES OF URANYL ION ADSORPTION ON ACRYLONITRILE (AN)/POLYETHLENE GLYCOL (PEG) INTERPENETRATING NETWORKS (IPN)

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The kinetics of the adsorption of uranyl ions on amidoximated acrylonitrile (AN)/ polyethylene gylicol (PEG) interpenetrating network (IPNs) from aqueous solutions was studied as a function of time and temperature. The IPNs were prepared by irradiation initiated gamma polymerisation using Co-60 gamma source. Adsorption capacities were performed for definite uranyl ion concentrations of $1x10^{-2}M$ and at four different temperatures as 290K, 298K, 308K and 318K by gamma spectrometer. Adsorption time was increased from zero to 48 hours. The results indicate that adsorption capacity increases linearly with increasing temperature. Temperature and agitation hardly influence equilibrium and kinetics and decreasing of temperature results in a slightly greater time to reach equilibrium.

The adsorption of uranyl ions has been studied in a multi step mechanism processes thus comparing chemical sorption and diffusion sorption processes. The experimental data was analysed using various kinetic models to determine the best-fit equation for the adsorption mechanisms. However, it was shown that all models, in general according to the reaction time and uranyl ion concentration in the solution, could describe the adsorption of uranyl ion onto amidoximated IPN, the adsorption kinetics was best described by zeroth order and intraparticle diffusion model whereas that of in increasing time by pseudo first and pseudo second order response respectively. External-intraparticle diffusion and zeroth order process in the IPN structure is proposed as a mass transfer mechanism and the results indicate a diffusion-controlled process.

The Mean Activation Energy Of Uranyl Ions Adsorption Was Found As 4,1 Kj/Mole By Using Arrhenius Equation. The Rate Constant, The Equilibrium Adsorption Capacity And The İnitial Adsorption Rate Were Calculated For All Models At Each Temperature. Kinetic Parameters Of All Models And The Normalized Standard Deviations Between The Measured And Predicted Results Were Also Calculated And Discussed. The Experimentally Based Models Give Very Similar Results And Consequently Similar Values Of The Deviation Error Values, Whereas The Error Values For The Empirical Correlation Were Greater Than These Three Values.