THERMODYNAMICS OF ELECTROCHEMICAL BEHAVIOR OF STEEL ELECTRODE IN PRESENCE OF SURFACTANTS

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Study of electrochemical processes and use of thermodynamic parameters for elucidation of kinetics of corrosion processes permit to solve both theoretical and applied problems of anticorrosive protection of metals.

For characteristics of electrochemical behavior of steel electrode in 0.1 M KNO₃ and in presence of polyvinylpirrolidone (PVP) at cathode and anode polarizations the thermodynamic parameters which increase the possibility of analysis of the process studied are calculated.

It is shown that at cathode polarization introduction of PVP additive leads to increase of $\Delta H_{\text{ef}}^\circ$, $\Delta S_{\text{ef}}^\circ$ values do not change very much. At low values of electrode polarization $\Delta G_{\text{ef}}^\circ$ increases and at increase of polarization it changes a little. This points to increase of enthalpy factor of cathode process. It should be noted that $\Delta H_{\text{ef}}^\circ$ at $T = \text{const}$ practically doesn’t change and $\Delta S_{\text{ef}}^\circ$ shifts to the region of more positive values. Increase of temperature at $\eta = \text{const}$ leads to decrease of $\Delta H_{\text{ef}}^\circ$ and $\Delta S_{\text{ef}}^\circ$ practically doesn’t change, that is the state of the system remains unchanged. Operation of the system at all kinds of overvoltage increases.

Comparison of thermodynamic parameters at anode polarization in absence and presence of PVP shows that introduction of PVP additive leads to increase of $\Delta H_{\text{ef}}^\circ$ reaction at all overvoltages considered. As is in absence of PVP the temperature doesn’t change considerably the value of $\Delta H_{\text{ef}}^\circ$. At introduction of surfactant additive entropy of activation shifts to the region of more positive values at all overvoltages considered. This points to the fact that the system acquires more ordered form. As a result of such changes the value of $\Delta G_{\text{ef}}^\circ$ changes inconsiderably. The change of thermodynamic parameters depending upon temperature takes place in the same conditions as is in absence of PVP.