PE01

Use of ^{14}C-Marked Organic Compounds to Investigate the Surface in Corrosion Inhibition of Iron in CO_2 Saturated Solutions

강영구, John O'M. Bockris*

한국화학연구소 화학소재 1팀, *Dept. of Chemistry Texas A&M University

In this study, ^{14}C-marked organic compounds such as phenylalanine and n-decylamine have been used as probes to investigate the surface of iron during its corrosion in pH 4 CO_2 saturated NaCl solution. The surface coverages are strongly dependent on the applied potential. The adsorption curves(surface coverage-potential curve) of phenylalanine and n-decylamine show bell-shape curve with maximum. The adsorption characteristic of organic compound is substantially same both in CO_2 free solution and in CO_2 saturated solution. The maximum adsorption was obtained at ca. -650mV (vs. NHE) both for phenylalanine and for n-decylamine. The maximum surface concentration appears at about 100mV more negative than the corrosion potential (-550mV vs. NHE). This potential of the maximum adsorption of organic compound is consistent with the potential of zero charge of iron electrode that measured by means of double layer capacitance measurement. Maximum surface coverage of phenylalanine and n-decylamine in CO_2 saturated solution were 0.576×10^{-10} moles/cm^2 and 2.21×10^{-10} moles/cm^2, respectively. The maximum coverage is strongly related to the corrosion inhibition efficiency.

The adsorption of inhibitor-like organic compounds on iron shows similar behavior just as they would have on a metal surface in CO_2 free solution. It is postulated that at least some part of the surface is therefore bare and organic inhibitors adsorb on this and not on iron carbonate films (which may, however, cover part of the surface).