




## Corrosion control of vanadium in aqueous solutions by amino acids

Journal of Alloys and Compounds Volume 459, Issues 1–2, 14 July 2008, Pages 466–471

- M.M. El-Rabeeb<sup>b</sup>,
- N.H. Helal<sup>b</sup>,
- Gh.M. Abd El-Hafez<sup>b</sup>,
- W.A. Badawy<sup>a</sup>,   

- <sup>a</sup> Chemistry Department, Faculty of Science, Cairo University, Giza, Egypt
- <sup>b</sup> Chemistry Department, Faculty of Science, Fayoum University, Fayoum, Egypt

- Abstract

- The electrochemical behavior of vanadium in amino acid free and amino acid containing aqueous solutions of different pH was studied using open-circuit potential measurements, polarization techniques and electrochemical impedance spectroscopy (EIS). The corrosion current density,  $i_{corr}$ , the corrosion potential,  $E_{corr}$  and the corrosion resistance,  $R_{corr}$ , were calculated. A group of amino acids, namely, glycine, alanine, valine, histidine, glutamic and cysteine has been investigated as environmentally safe inhibitors. The effect of Cl<sup>-</sup> on the corrosion inhibition efficiency especially in acid solutions was investigated. In neutral and basic solutions, the presence of amino acids increases the corrosion resistance of the metal.
- The electrochemical behavior of V before and after the corrosion inhibition process has shown that some amino acids like glutamic acid and histidine have promising corrosion inhibition efficiency at low concentration ( $\approx 25$  mM). The inhibition efficiency ( $\eta$ ) was found to depend on the structure of the amino acid and the constituents of the corrosive medium. The corrosion inhibition process is based on the adsorption of the amino acid molecules on the metal surface and the adsorption process follows the Freundlich isotherm. The adsorption free energy for valine on V in acidic solutions was found to be  $-9.4$  kJ/mol which reveals strong physical adsorption of the amino acid molecules on the vanadium surface.