Corrosion Protection of Copper in Sodium Chloride Solution using Propolis

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In this investigation the possibility of inhibiting corrosion of copper using ethanol extract of propolis in 0.5 mol dm⁻³ NaCl solution was investigated. The measurements were carried out in 200 cm³ of NaCl solution to which 4 ml of ethanol extract of propolis was added. Also, the protective effect of propolis coating, which was formed by applying the ethanol extract of propolis to the electrode surface, followed by air drying for 24 h, was investigated. Experiments were performed using electrochemical methods: open circuit potential measurements, linear and potentiodynamic polarization method and electrochemical impedance spectroscopy measurements (EIS). The results showed that the coating of propolis significantly shifted the value of the open circuit potential of Cu to more positive values, significantly increased the value of polarization resistance and as well led to a reduction in corrosion current density. On the other hand, addition of propolis in solution yielded minor changes in the value of the stable open circuit potential of copper, but increased the value of polarisation resistance and decreased the corrosion current density. After polarisation measurements, the electrode surface was examined by optical microscopy. Quantum chemical modelling of selected constituents of propolis was undertaken in order to ascertain their contributions to the corrosion inhibition performance.

Keywords: copper; corrosion; corrosion inhibition; electrochemical techniques; propolis

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