In Situ Investigation of the Passivation of Alloy C22 and of the Passive Films Formed on Alloy C22 in Acidic Electrolytes at Room Temperature and at 90°C

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The passive films formed on Alloy C22 in several acidic solutions were investigated by a combination of five *in situ* techniques: cyclic polarization, electrochemical impedance spectroscopy, Mott-Schottky analyses, electrochemical quartz crystal microbalance measurements, and surface enhanced Raman spectroscopy. Similar tests were conducted on unalloyed samples of nickel, chromium and molybdenum, which are the main alloying elements of Alloy C22. The results of the tests conducted on nickel, chromium, and molybdenum helped to determine the roles of these elements in the passivation of Alloy C22. In general, the corrosion resistance of C22 was superior to that of unalloyed chromium. Although chromium is an important component of the passive film on Alloy C22, the other elements figure prominently in the corrosion resistance of C22 in acidic solutions. The passivity of Alloy C22 was detrimentally affected by increasing concentrations of hydrogen ions, chloride ions, and increasing temperature. The results of this study provide understanding of the resistance/susceptibility of Alloy C22 to corrosion by the aggressive solutions that can develop inside pits and crevices.