Characterization of Water-Filled Ag/AgCl Reference Electrode

Chi Bum Bahn, Sihyoung Oh, and Il Soon Hwang
Seoul National University
San 56-1, Shinlim-dong, Kwanak-gu, Seoul 151-742, Korea
Hahn Sup Chung, and Sung Jegarl
Korea Electric Power Research Institute
103-16, Munji-dong, Yusong-gu, Teajon 305-380, Korea

Abstract

Pressure-balanced external Ag/AgCl electrode has been extensively used for both Pressurized Water Reactor (PWR) and Boiling Water Reactor (BWR) environments. The use of KCl-based buffer solution often becomes the source of electrode potential drift due to slow leakage through its porous plug, typically made of zirconia. We report results of our effort to improve the stability of electrode potential by using high purity water as the filling solution in which Cl^- ion activity can be established at the solubility of AgCl despite of the leakage problem. Stability tests have been made in boron and lithium mixture solution at 288 °C. The electrode potential remained stable within ± 10 mV over two weeks period. A thermal cycling to 240 °C and back to 288 °C led to a potential shift not exceeding 15 mV. By using the limiting equivalent conductances and Agar's theory, the thermal liquid junction potential (TLJP) of the electrode has been predicted. Despite of its outstanding stability performance, the agreement between measured and predicted values for the water-filled Ag/AgCl electrode is not satisfactory, apparently due to uncertainty in the predicted electrochemical parameters.

Electrochemical Impedance Spectroscopy of Anodic Passive Film on Alloy 600 at Room Temperature

Sihyoung Oh, Il Soon Hwang
Seoul National University
San 56-1 Shinlim-dong, Gwanak-ku
Seoul, Korea 151-742

Abstract

Electronic structure of the metal/passive film/solution system was modeled based on the Point Defect Model and the work of Armstrong et al and its characteristics was investigated by potentiodynamic polarization and Electrochemical Impedance Spectroscopy(EIS) measurement for a commercial alloy 600 at room temperature.

The modeling of metal/passive film/solution system showed the system could be described by well developed equivalent circuit. From EIS measurement of the passive film on Alloy 600 diffusivity of oxygen vacancies was estimated to 2.0724×10^{-14} cm^2/sec