Hydrogen pressure-hydrogen content and electrical resistance-hydrogen content relationships of palladium and palladium alloy-hydrogen systems

Lewis, F.A.[a], Kandasamy, K.[b], McNicholl, R.-A.[a] and Tong, X.Q.[cd]

[a] School of Chemistry, Queen's University, Belfast, BT9 5AG, N. Ireland
[b] Department of Physics, University of Jaffna, Jaffna, Sri Lanka
[c] Department of Materials Science and Engineering, Tsinghua University, Beijing, China
[d] Department of Metallurgy and Materials, University of Birmingham, B15 2TT, United Kingdom

Abstract

Increasingly detailed findings of hydrogen pressure-hydrogen content-temperature [p-c(n)-T] relationships of the palladium-hydrogen system have continued to be reported and there have also been very substantial increases in p-c(n)-T information for palladium alloy-hydrogen systems, extending to a very wide range of alloy composition. One convenient technique for obtaining p-c(n)-T relationships at near 25 °C has involved derivations from electrode potential measurements using specimens with which sensitive changes of electrical resistance could be measured in conjunction. Discussion continues in regard to origins of hysteretic differences between forms of relationships obtained in courses of increases or decreases of hydrogen content, respectively. Associated discussion also continues concerning critical points defined with reference to suppression of hysteresis effects. In these regards there has been recent research interest in the hydrogen systems of palladium alternatively allied with either of pairs of elements in the same subgroup of transition metals, namely Ti, Zr; V, Nb and Sc, Y. Results have emphasized the key role of relative atomic dimensional and electronegative differences between the alloying elements in determining their modifying influences on p-c(n)-T relationships.

Indexed keywords

Engineering controlled terms: Absorption; Alloying elements; Deformation; Desorption; Electric resistance; Electric variables measurement; Hysteresis; Palladium alloys; Pressure effects; Reaction kinetics; Thermal effects; Transition metals

Engineering uncontrolled terms: Electrode potential measurement; Hydrogen content; Hydrogen pressure; Palladium hydrogen system

Engineering main heading: Hydrogen