

Influences of self-induced stress on permeation flux and space-time variation of concentration during diffusion of hydrogen in a palladium alloy

Kandasamy, K.^{ab}

^a Department of Physics, University of Jaffna, Jaffna, Sri Lanka

^b Department of Chemistry, Queen's University, Belfast, United Kingdom

Abstract

The nature of hydrogen diffusion in a tubular membrane of a Pd₈₁Pt₁₉ alloy is discussed. The effect of self-induced stress on (a) the space-time variation of hydrogen concentration and (b) the diffusion flux in the steady state are presented. The experimental results are explained qualitatively assuming that the concentration profile at steady state is non-linear. The activation energy and the pre-exponential factor of the Arrhenius relation for the diffusion coefficient are estimated for hydrogen diffusion in a Pd₈₁Pt₁₉ alloy membrane containing no hydrogen prior to the diffusion process. Estimated values are in good agreement with published experimental results.

Indexed keywords

Engineering controlled terms: Activation energy; Boundary conditions; Concentration (process); Diffusion; Membranes; Palladium alloys; Stresses

Engineering uncontrolled terms: Arrhenius relation; Fick law; Permeation flux; Self induced stress; Space time variation

Engineering main heading: Hydrogen