

The influences of induced elastic fields on permeation of hydrogen in palladium and palladium alloys

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Abstract

Recent hydrogen permeation studies in Palladium and Palladium alloys have provided definite evidence for the influence of diffusion induced elastic stress on permeation processes. Such influence will introduce an important factor in estimations of chemical diffusion coefficient and solubility of hydrogen in these metals using permeation results. Complications due to correlated space-time variation of induced elastic stress and dissolved hydrogen concentration make even assessment of error in such estimation is difficult. A complete theoretical account of the effect of induced elastic stress on hydrogen permeation is not yet available. In the present work an approximate space-time variation of hydrogen concentration will be assumed. Using this concentration, variations of flux and pressure with time are computed. General agreements of these computed variations with experimental results are indicated. Possible effects of dissolved hydrogen in metallic membranes and average hydrogen concentration gradients imposed on the permeation processes are discussed.

Author keywords

Diffusion; Hydrogen; Palladium; Palladium Alloys; Stress Induced Diffusion