

# Hydrogen diffusion coefficient dependencies on hydrogen contents in PdAg alloys

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## Abstract

Values of hydrogen diffusion coefficients,  $D_H$ , calculated from measurements of hydrogen permeation through membranes, preferably require reference information concerning both surface and substrate bulk hydrogen contents  $n$  (H/M, atomic ratio). For satisfactory conditions of surface catalytic activity, appropriate values of  $n$  may also be able to be correlated with experimental parameters of temperature  $T$  and hydrogen chemical potential (as commonly represented either by hydrogen gas pressure  $p$  or electrode potential  $E$ ) through  $p$  ( $E$ ) -  $c$  ( $n$ ) -  $T$  relationships. In cases of palladium and palladium alloys, estimations of  $D_H$  dependencies on  $n$  at relatively low temperatures (e.g. 25°C) have been quite widely derived by breakthrough technique considerations of electrolytic experiments. Latterly, however, it has been evidenced that determinations of  $D_H$  with initial membrane hydrogen contents of  $n > 0$  can be substantially affected by strain gradients self induced by the diffusing hydrogen interstitials themselves. Assessments of such strain gradient influences on dependencies of  $D_H$  on  $n$  have now been examined in the case of the  $Pd_{81}Pt_{19}H_n$  system. Substantial analogous influences on dependencies of  $D_H$  on  $n$  in the case of the technologically important  $Pd_{77}Ag_{23}H_n$  system have also been discussed in preliminary reports. The present paper is concerned with further consolidation of allied information for  $Pd_{77}Ag_{23}$  alloys.

## Author keywords

Diffusion Coefficient; Hydrogen; Palladium; Silver