Gorsky effect consequences of lattice expansive strain gradients in diffusion of hydrogen in metals

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Abstract

Among transition metals forming hydrides of a metallic type, palladium and certain palladium alloys have been preferentially utilised as membranes for hydrogen purification - in view of their relative resistances to embrittlement, high solubilities for hydrogen, as derivable from quite comprehensive p - c (n) - T relationships, and accompanying high values of hydrogen diffusion coefficients. As fairly recent points of interest, uphill effects corresponding to temporary localised hydrogen permeation against overall hydrogen concentration gradients have been observed in studies with membranes of Pd, $Pd_{77}Ag_{23}$ and $Pd_{81}Pt_{19}$. These uphill effects have been associated with hydrogen migrations induced by Gorsky Effects resulting from developments of gradients of lattice strain produced by the expansive effects of the permeating hydrogen interstitials. An outline is presented of experimental methods and results of measurements together with some theoretical and technological correlations.

Author keywords

Gorsky Effect; hydrogen; palladium alloys; strain gradients; uphill diffusion