INFLUENCE OF NANOXIDES ON DIFFUSITY AND SOLUBITY OF HYDROGEN IN PALLADIUM

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The Pd is a noble and costly metal, however, it has special characteristics with regard to hydrogen, such as excellent kinetics of adsorption and absorption of hydrogen, durability and efficiency as a function of hydrogen loading and unloading, as well as good mechanical resistance when there is formation of the hydride phase. The Pd-H system has many engineering applications, such as fuel cells, filters and hydrogen separators, and can also be used as hydrogen storage tanks and catalysts. So that, the interaction of hydrogen in palladium alloys with addition of Ce, Z and Y were studied in this work. These alloys were produced in an electric-arc furnace and then cold worked (rolling). Different thermal treatments were applied to several samples in order to!different thermal treatments were applied to several samples in order to induce internal oxidation which induces formation of precipitates of Cerium, Zirconium and Yttrium oxides.
Characterization and structural properties of the precipitates were conducted using SEM and TEM techniques. Hydrogen permeation tests were also undertaken in the alloys in order to describe the influence of the microstructure on the diffusivity, the solubility and also the formation of hydride. Furthermore, Thermal Desorption Spectroscopy (TDS) was carried out on Pd-Y alloys to highlight the hydrogen traps. Samples internally oxidized at 1073 K during 24h show smaller values of hydrogen diffusivity and higher values of hydrogen solubility than other samples treated using different conditions. This is due to the presence of nanometric precipitates of CeO_2, ZrO_2 and Y_2O_3 induced by the internal oxidation. Theses precipitates are cristallographically coherent with palladium matrix and induce strong distortion in the matrix and thus effectively interact with the hydrogen. When precipitates increases, interaction with hydrogen is getting smaller, increasing values of diffusivity and reducing values of solubility of hydrogen in alloys.