Hydrogen solubility and diffusivity in amorphous, nanocrystalline compounds and defective crystalline alloys

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The effects of hydrogen on metals and alloys have generated major scientific and technological interest due to three factors: hydrogen storage, embrittlement and applications, Hy-SEA. The mechanisms that lead to embrittlement and storage capacity depend on the hydrogen mobility through the material's structure as well as the H- metal/alloy microstructure interaction.

The search for new alloys, more mechanically resistant to hydrogen, and for new metallic materials capable of absorbing large amounts of hydrogen has been a great challenge for the last decades.

The present work aims to make a critical approach to the results obtained through hydrogen permeation techniques during recent years by our group. These encompass the effects of each type of structure (amorphous, crystalline, or nanocrystalline) on hydrogen diffusibility and solubility, the presence of fine nanometric precipitates that delay hydrogen diffusion and the contribution to short circuit diffusion caused by the presence of a high density of gaps and dislocations.

Amorphous alloys based on iron and nickel, as well as crystalline palladium and nanocrystalline nickel, are used in comparison to employed materials such as nickel alloys and multiphase steels. !