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Structural investigation of Pd/Zr/Pd/Ti/Pd multilayered system implanted with 150 keV argon ions for hydrogen storage application

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A multi-layered system of titanium (Ti), zirconium (Zr), and palladium (Pd) was successfully prepared on different substrates using an electron beam evaporator (NEE-4000) for hydrogen storage applications. Ti alloy (Ti-6Al-4V) and pure commercial Ti (cp-Ti) were used as substrates to prepare stacked layers of Pd/Ti/Pd/Zr/Pd. The phase transformation was studied using X-ray diffraction (XRD) and Rutherford backscattering spectroscopy (RBS), which allowed a deep understanding of how these metals interact with each other before and after introducing hydrogen. These techniques were also used to investigate the effect of ion implantation, and the results were compared to those of as-prepared samples. XRD reveals that there was a diffusion of atoms between the layers, resulting in the formation of Ti-Pd and Zr-Pd alloys before implantation and hydrogenation; this was also confirmed by RBS. When the samples were implanted with argon ions at different fluencies (1012, 1013, 1014, 1015, and 1016, respectively), a shift in crystal angle (2θ) was observed but no noticeable alteration in the crystal structures. The Pd layer was used to reduce oxidation between the Ti and Zr layers. Both prepared and implanted samples showed evidence of oxidation between the two layers, which resulted from the chamber's residual gases.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

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