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Interstitial-atom-induced phase transformation upon hydrogenation in vanadium

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Abstract

The effect of interstitial atoms (nitrogen, carbon) on hydrogen storage properties in vanadium was investigated. When the N concentration was below 0.4 wt%, the plateau pressures increased with increasing N concentration during absorption and desorption and vanadium samples (body-centered cubic (BCC)) transformed to $VH_{0.5}$ (body-centered tetragonal (BCT), c/a = 1.1) and then VH_2 (face-centered cubic (FCC)). When the N concentration exceeded 0.6 wt%, a new single-phase region appeared in the pressure-composition isotherm, suggesting the formation of a new hydride phase. The X-ray diffraction data indicated that this new hydride phase was $VH_{1.0}$ with a BCT structure and c/a = 1.24, and the phase transformation took place as V (BCC) became