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Hydrogen storage performances of $TiCr_{1.8-X}(VFe)_X$ alloys

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Abstract

As a representative of the third generation hydrogen storage alloys, TiCr based alloys were studied for hydrogen storage. V-Fe alloy was used to substitute partial Cr of $TiCr_{1.8}$ to improve its hydrogen storage capacity. According to XRD patterns the phase constitution changed from the coexistence of Laves phases and body centered cubic(BCC) phase to single BCC phase with increasing V-Fe content. Pressure composition temperature(PCT) tests showed the hydrogen storage capacity increases with the increase of V-Fe content and the hydrogen storage capacity of $TiCr_{1.2}(VFe)_{0.6}$ reached 3.2wt%. As thermogravimetry(TG) tests indicated the hydrogen desorption capacity of $TiCr_{1.2}(VFe)_{0.6}$ reached up to 1.8wt% under 1 atm of hydrogen absorbing pressure. Differential scanning calorimetry(DSC) displays three are peaks on DSC curve corresponding to the decomposition of three hydrides. Mass spectrometry(MS) tests demonstrated hydrogen atoms were set free in a lower temperature range and sent out in molecular state in a higher range.