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Investigation of effect of ball milling on hydrogen storage properties of 52Ti-12V-36Cr.

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Hydrogen is a promising renewable energy vector that could be used in chemistry or to produce electricity via a fuel cell. Hydrogen can be stored in various forms such as gaseous, liquid, and metal hydrides. Metal hydrides are particularly attractive because of their low operation pressure and high volumetric capacities. In this communication we report the effect of ball milling on the hydrogen storage properties of a titanium based alloy having a body centred cubic (BCC) crystal structure. It is known that Ti-V-Cr based BCC solid solutions alloys are performing well at room temperature and atmospheric pressure. But one problem is the slow first hydrogenation. However, the first hydrogenation can be improved by high energy ball milling. In the present investigation, a BCC alloy of composition 52Ti-12V-36Cr was synthesized by arc melting and afterward subjected to high energy milling for various durations (15 min, 30 min, 1 hr, 2 hrs, 5 hrs, 10 hrs, and 20 hrs). The microstructure was studied by scanning electron microscopy (SEM) and composition of the various phases measured by Energy-dispersive X-ray spectroscopy (EDX). The crystal structure was investigated by X-ray diffraction. The activation and hydrogen storage properties were measured using a homemade hydrogen titration system. The correlation between milling time and hydrogen storage properties will be reported.

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