

ELECTRON-BEAM SINTERING OF TiH_2 WITH IMPOSITION OF MECHANICAL OSCILLATIONS

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For practical applications, powdered titanium alloys should have physic-mechanical characteristics at the level of traditional crystallized from melt. Generally, the lower mechanical characteristics of sintered titanium, caused by large amount of impurities which are always present on the surface of the powder particles. Reduce the negative effects of impurities, is possible due to the use a titanium hydride powder as a starting powder.

In paper [1] the nature of the impurities on the surface of titanium hydride powder and the possibility of purification of the material by heating in vacuum is investigated. It is shown that atomic hydrogen that excels upon heating the titanium hydride is effective metal cleaner of impurities such as oxygen and chlorine.

Since the speed and completeness of the chemical reduction reaction depends on the concentration of hydrogen on the surface of the powder particles, which depends on the speed of decomposition of the titanium hydride, that is the aim of this work was to study the effect of intensifying the process of hydrogen release, by imposing mechanical vibration, on the purity, the formation of the structure and mechanical properties of compacts under electron-beam sintering.

As a starting was applied titanium hydride powder with a mean particle size of 7 microns. Compacts are heated to a temperature of 1350 ° C (holding time 5 minutes) in the electron beam installation "ELA - 6" with and without imposition of mechanical oscillations. Frequency of mechanical oscillations was 22 kHz.

Imposition of mechanical oscillations on compacts of titanium hydride powder during sintering intensifies the process of dehydration and removal of hydrogen from the bulk of compacts, which helps to clean titanium from

the impurities of oxygen and activates the processes of compaction (Fig. 1).

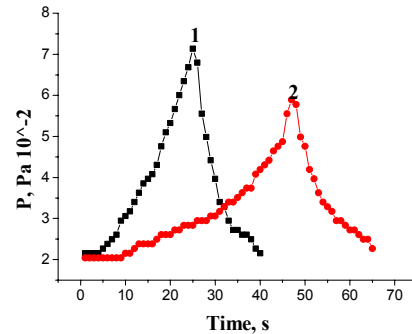


Fig. 1 Isolation of hydrogen during the dehydro-genation of TiH_2 with the imposition (1) and without imposition of mechanical oscillations (2)

Showed a decrease in half the average grain size of the sintered titanium with the imposition of mechanical oscillations in comparison with sintered without imposing of mechanical oscillations.

Found, that after sintering with imposition of mechanical oscillations in the compacts formed compressive stresses, and without the imposition of mechanical oscillations tensile stress. Due to the stress, as well as higher density, and smaller size of grains in the sintered compacts which sintering with the imposition of mechanical oscillations, Young's modulus, ductility characteristics and compressive strength, higher than that of samples sintered without imposing mechanical oscillations.

1.О.М. Івасишин, О.Б. Бондарчук, М.М. Гуменяк, Д.Г. Саввакін. Поверхневі явища при нагріванні порошку гідриду титану // Фізика і хімія твердого тіла. – 2011. – т.12. – №4. – С. 900-907.