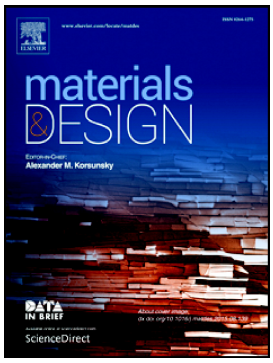

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PII: S0264-1275(17)30061-8
DOI: doi: 10.1016/j.matdes.2017.01.044
Reference: JMADE 2685

To appear in: *Materials & Design*

Received date: 20 September 2016
Revised date: 11 January 2017
Accepted date: 15 January 2017

Please cite this article as: Zhibin Han, Chunjie Wang, Liqun Shi , Synthesis and characterization of helium-charged titanium hydride films deposited by direct current magnetron sputtering with mixed gas. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Jmade(2017), doi: 10.1016/j.matdes.2017.01.044

Synthesis and characterization of helium-charged titanium hydride films deposited by direct current magnetron sputtering with mixed gas

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Abstract

Controllable helium-containing TiH_2 phase films were prepared on Si (100) substances by magnetron sputtering with hydrogen-helium-argon mixed gas, in order to investigate the helium behavior in titanium tritide. The TiH_xHe films were characterized by ion beam analysis (IBA) in which elastic recoil detection (ERD) and Rutherford backscattering spectrometry (RBS) methods are included, X-ray diffraction (XRD) and scanning electron microscope (SEM). It is found that with the increase in the relative hydrogen flow rate (Q_H: Q_{Ar}) under the fixed helium flow and sputtering pressure, the hydrogen concentration in TiH_xHe films increases at first, and then decreases. Though the hydrogen concentration in TiH_xHe films can be greatly increased by increasing the total sputtering pressure, excessive sputtering pressure will deteriorate the crystallization quality. Although the helium concentration mainly relies on the relative helium flow rate of mixed gas during sputtering, the increase of the relative helium flow rate will reduce the concentration of hydrogen in films at fixed sputtering pressure dramatically. Fortunately, suitable relative hydrogen flow

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