

Accepted Manuscript

Investigation of structural network and mechanical properties of Titanium silicon nitride (TiSiN) thin films

Spandan Guha, Soham Das, Asish Bandyopadhyay, Santanu Das, Bibhu P. Swain



PII: S0925-8388(17)33402-3

DOI: [10.1016/j.jallcom.2017.09.340](https://doi.org/10.1016/j.jallcom.2017.09.340)

Reference: JALCOM 43396

To appear in: *Journal of Alloys and Compounds*

Received Date: 19 July 2017

Revised Date: 29 September 2017

Accepted Date: 30 September 2017

Please cite this article as: S. Guha, S. Das, A. Bandyopadhyay, S. Das, B.P. Swain, Investigation of structural network and mechanical properties of Titanium silicon nitride (TiSiN) thin films, *Journal of Alloys and Compounds* (2017), doi: 10.1016/j.jallcom.2017.09.340.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Investigation of Structural network and Mechanical Properties of Titanium Silicon Nitride (TiSiN) Thin Films

Spandan Guha¹, Soham Das¹, Asish Bandyopadhyay², Santanu Das³, Bibhu P. Swain^{1,4}

¹Department of Mechanical Engineering, Sikkim Manipal Institute of Technology, Majhitar, India-737136

²Department of Mechanical Engineering, Jadavpur University, Kolkata, India-700035

³Department of Mechanical Engineering, Kalyani Government Engineering College, Kalyani, India-741235

⁴Centre for Material Science and Nanotechnology, Sikkim Manipal Institute of Technology, Majhitar, India-737136

* Corresponding author Emails: bibhu.s@smit.smu.edu.in, bibhuprasad.swain@gmail.com

Abstract:

Titanium silicon nitride (TiSiN) thin films were deposited on p-type c-Si (100) with different N₂ flow rate by using chemical vapor deposition (CVD) technique. The microstructure, phonon modes, mechanical properties and compositional study of TiSiN thin films were characterised by scanning electron microscope (SEM), X-ray diffraction (XRD), Raman spectroscopy, nanoindentation and X-ray photoelectron spectroscopy (XPS), respectively. The SEM images show increases in surface roughness with increasing of N₂ flow rate, however, improves the hardness and Young's modulus of TiSiN thin film. The XRD analysis reveals the presence of strain in TiSiN films. The estimated crystallites of TiSiN thin films was 7.51 and 7.39 nm for 40 and 100 sccm N₂ flow rate. The XPS reveals the presence of 20 at. % Si content at 40 sccm N₂ flow rate in the TiSiN film. To analyse the broad Raman spectra of TiSiN thin films, the peaks were convoluted into six individual Gaussian peaks. The quantitative and qualitative analysis XPS and Raman spectra of TiSiN thin films were carried out by using Origin 9.0 software.

Keywords: Thermal CVD, Mechanical properties, SEM, XRD, Raman, Nanoindentation.

Download English Version:

<https://daneshyari.com/en/article/5458045>

Download Persian Version:

<https://daneshyari.com/article/5458045>

[Daneshyari.com](https://daneshyari.com)