

Accepted Manuscript

Title: COMPARATIVE INVESTIGATION OF Si-C-N FILMS PREPARED BY PLASMA ENHANCED CHEMICAL VAPOUR DEPOSITION AND MAGNETRON SPUTTERING

Authors: A.O. Kozak, O.K. Porada, V.I. Ivashchenko, L.A. Ivashchenko, P.L. Scrynsky, T.V. Tomila, V.S. Manzhara



PII: S0169-4332(17)31987-6
DOI: <http://dx.doi.org/doi:10.1016/j.apsusc.2017.06.332>
Reference: APSUSC 36532

To appear in: *APSUSC*

Received date: 14-3-2017
Revised date: 28-3-2017
Accepted date: 30-6-2017

Please cite this article as: A.O.Kozak, O.K.Porada, V.I.Ivashchenko, L.A.Ivashchenko, P.L.Scrynsky, T.V.Tomila, V.S.Manzhara, COMPARATIVE INVESTIGATION OF Si-C-N FILMS PREPARED BY PLASMA ENHANCED CHEMICAL VAPOUR DEPOSITION AND MAGNETRON SPUTTERING, *Applied Surface Science* <http://dx.doi.org/10.1016/j.apsusc.2017.06.332>

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.

COMPARATIVE INVESTIGATION OF Si-C-N FILMS PREPARED BY PLASMA ENHANCED CHEMICAL VAPOUR DEPOSITION AND MAGNETRON SPUTTERING

A.O. Kozak¹, O.K. Porada¹, V.I. Ivashchenko¹, L.A. Ivashchenko¹, P.L. Scrynsky¹,
T.V. Tomila¹, V.S. Manzhara²

¹*Institute for Problems of Materials Sciences NAS of Ukraine, 3, Krzhyzhanovsky Str., 03142 Kyiv, Ukraine*

²*Institute of Physics NAS of Ukraine, 46, Nauki ave., 03028 Kyiv, Ukraine*

Highlights

- Si-C-N films were prepared by magnetron sputtering and PECVD
- An effect of nitrogen flow rate on film properties is studied
- Structural, mechanical and photoluminescence properties are analyzed
- The film surface has extremely low roughness
- An explanation of the mechanical properties of both types of the films was done

ABSTRACT

This paper reports on the results of comparative investigations of Si-C-N films prepared by using both plasma enhanced chemical vapor deposition (PECVD) and DC magnetron sputtering (MS) at different nitrogen flow rates (F_{N_2}). The films were characterized by an atomic force microscope, X-ray diffraction, Fourier transform infrared spectroscopy, X-ray photoelectron spectroscopy, nanoindentation and photoluminescence spectroscopy. All the deposited films were X-ray amorphous. For the PECVD films, nanohardness (H) and elastic module (E) increase with F_{N_2} , which can be assigned to decreasing the hydrogen content. On the contrary, for the films, deposited by magnetron sputtering, the values of H and E decrease, when F_{N_2} increases. The latter is supposed to be due to decreasing a number of strong Si-C bonds and to increasing a number of weak Si-N and C-N bonds. The surface roughness of two types of the films is smaller compared to that of silicon substrates. An increase in nitrogen flow rate causes the smoothing of the film surfaces. The PECVD films deposited at high F_{N_2} exhibit bright photoemission with the main peak at ~ 440 nm. The intensity of this peak increases with increasing nitrogen content.

Keywords: Amorphous Si-C-N films, Plasma-enhanced chemical vapor deposition, DC magnetron sputtering, Chemical bonding, Nanoindentation, Photoluminescence.

1. INTRODUCTION

Download English Version:

<https://daneshyari.com/en/article/5347387>

Download Persian Version:

<https://daneshyari.com/article/5347387>

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