2012 Technical Symposia

Call For Papers
Abstract Deadline: October 1, 2011
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The International Conference on Metallurgical Coatings and Thin Films or ICMCTF is internationally recognized as a vibrant technical conference that integrates fundamental and applied research focused on thin film deposition, characterization, and advanced surface modification techniques. It is the premier international meeting in this field, bringing together scientists and technologists from both academia and industry, thereby merging up to date research with cutting edge applications.

The conference consistently draws more than 700 attendees each year within 32 oral technical sessions and a well-attended poster session.

ICMCTF 2012 is organized in seven concurrent technical symposia A through G and four special topical symposia, which address experimental, theoretical, and manufacturing issues associated with development of new coating materials and processes, and evolving approaches to scale-up for commercial applications.

In addition to the technical program, the conference features a two-day industry exhibition, which is open to the public, showcasing the latest in equipment, materials and services used for the deposition, monitoring and characterization of coatings and thin films. Short courses and Focused Topic Sessions (FTS) will be offered throughout the conference week.

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B. Hard Coatings and Vapor Deposition Technology
C. Fundamentals and Technology of Multifunctional Thin Films
D. Coatings for Biomedical and Healthcare Applications
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F. New Horizons in Coatings and Thin Films
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2012 Topical Symposia:

TS1. Surface Engineering for Thermal Transport, Storage and Harvesting
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used to synthesize thick CrN/AlN multilayer coatings (up to 10 µm). The Cr target was powered by the MPP technique while the Al target was powered by the PMS technique simultaneously in an Ar/N_2 mixture. The bilayer period of the coatings was varied in a range of 10 nm to 2.5 nm by varying the ratio of the N_2 flow rate to the total gas flow rate. The microstructure and properties of the CrN/AlN coatings were characterized using electron probe microanalysis, X-ray diffraction, scanning electron microscopy, transmission electron microscopy, scratch test, nanoindentation, and ball-on-disk wear test. The thick CrN/AlN coatings has been annealed in the ambient air at 900 ^oC and 1000 ^oC for 2 hours and at 850 ^oC for 200 hours. The MPP+PMS CrN/AlN coatings showed good adhesion. Superhardness values of 40-45 GPa and low wear rates in the low 10^{-8} $mm^3N^{-1}m^{-1}$ range have been achieved in the coatings with the bilayer period in a small range of 2.5 to 3.2 nm. No oxides were identified in the coatings and the coating maintained cubic structure after annealing at 1000 ^oC for 2 hours and at 850 ^oC for 200 hours.

11:20am **F2.1-11 The uniformity in thickness and microstructure of CrN films fabricated using plasma ion implantation-deposition based on high power pulsed magnetron sputtering**, ***X.B. Tian*** *(Xiubotian@163.com), Z.Z. Wu, C.Z. Gong*, Harbin Institute of Technology, China, *P. Chu*, City University of Hong Kong

The uniformity in thickness and microstructure of CrN films fabricated using plasma ion implantation-deposition based on high power pulsed magnetron sputtering

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The high power pusled magnetron sputtering (HPPMS) has gained more interest due to higher ionization rate. A novel plasma ion implantation deposition based on high power pulsed magnetron discharge has been proposed in our group (RSI vol. 82, vol. 3, pp. 033511-1 – 033511-5 (2011).). A higher adhesion between the substrate and deposited film is easily achieved. More important multiple combination of high-voltage pulses applied to samples and HMMPS pulses leads to flexible processes including pure ion implantation, deposition assisted by ion implantation and pure deposition. This paper focuses on the uniformity of the thickness of CrN films achieved by plasma based ion implantation using high power pulsed magnetron discharge. The sample bias varied from 10kV to 30kV in addition to a lower bias (~ 100V) test. In comparison, the CrN films were also fabricated using the conventional DC magnetrons sputtering mode in the same facility. The thickness and microstructure at different sites on the exposed surfaces were analysized. The experimental results demonstrated that the non-uniformity of films by HPPMS was greatly decreased compared to that from the conventional DC mode.

11:40am **F2.1-12 Characterization of chromium and chromium nitride obtained by DC and HiPIMS sputtering techniques**, *A. Ferrec (axel.ferrec@cnrs-imn.fr)*, IMN - Nantes-France, *A. Tricoteaux, C. Nivot*, LMCPA-Maubeuge-France, ***F. Schuster***, Laboratoire Commun MATPERF CEA-Mecachrome, France, *M. Ganciu*, National Institute for Laser, Plasma and Radiation Physics, Romania, *P-Y. Jouan, A. Djouadi*, IMN - Nantes-France

CrN is an excellent wear and corrosion resistant material. There is much interest in the research community to develop CrN thin films for coating tools for metal and wood machining operations [1,2]. Chromium nitride was widely studied and developed by classical magnetron sputtering [3] and more recently for further improvements by HiPIMS [2,3].

In the frame of this work Cr and CrN thin films have been deposited using both DC and HiPIMS techniques. Two different HiPIMS discharges were used, one is conventional HIPIMS technology [6] and the other one is a new process based on a pre-ionisation system [7]. It allows working with pulses of few microseconds, while remaining in very stable conditions and avoiding the arc formation. The range of the pulse width was varied between 10 and 200µs and we have operated with a frequency between 80 and 1000 Hz. Physico-chemical (XPS, AFM, XRD, SEM+EDS) were performed. Structure and properties (especially residual stress) of the films, and aspects of film growth processes and their effects on film properties are discussed. The mechanical properties such as hardness have been characterised by microindentation tests. The Jönsson and Hogmark model [8] was applied to separate the contributions of the substrate and the films in order to determine their true hardness. These hardness results were analyzed and discussed according to the film microstructure.

Keywords

HiPIMS, DC sputtering, Chromium nitride

References

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