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## An XPS study on oxidation of exposed-to-air $\text{Cr}_{1-x}\text{Zr}_x\text{N}$ film surfaces

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### Abstract

Chromium zirconium nitride ( $\text{CrZrN}$ ) thin films were prepared on Si (100) substrates with various Zr contents by using co-sputtering technique. The Zr content was varied by variation of the Zr sputtering current from 0.2 to 0.8 A while the Cr current and the  $\text{N}_2$  flow rate were kept at 0.8 A and 6.0 sccm, respectively, to fix the concentration of Cr and N atoms. An oxidation caused by exposure to air of the  $\text{Cr}_{1-x}\text{Zr}_x\text{N}$  thin films were studied by using X-ray photoelectron spectroscopy (XPS). Chemical composition analysis of XPS spectra revealed that oxygen detected on the film surfaces was increased with the rise in the Zr content. Deconvolutions of O 1s photoemission lines revealed bonding separately of O atoms to Cr and Zr atoms. Moreover, the fraction of the O–Cr bond was increased with the increasing Zr content.

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*Keywords:* CrZrN; XPS; Oxidation; Thin film

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### 1. Introduction

Chromium zirconium nitride ( $\text{CrZrN}$ ) is one of the CrN-based ternary nitride coatings fabricated for improving protective properties that still possesses high oxidation resistance of the CrN [1–9]. The  $\text{CrZrN}$  has been reported on

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