Surface analyses of CrN coatings by Electron Back Scatter Diffraction

Herbert Scheerer¹, Holger Hoche², Elena M. Slomski³, Torsten Troßmann⁴, Christina Berger³

¹TU Darmstadt, Darmstadt, Germany ²MPA-IfW, TU -Darmstadt, Darmstadt, Germany
³MPA-IfW, TU-Darmstadt, Darmstadt, Germany ⁴MPA-IFW, TU-Darmstadt.de, Darmstadt, Germany

scheerer@mpa-ifw.tu-darmstadt.de

Electron backscatter diffraction (EBSD) is a well known technique used to study crystallographic microstructure and orientations of different materials with high spatial resolution. EBSD is conducted using a Scanning Electron Microscope (SEM) equipped with a backscatter diffraction camera and provides immediate crystal orientation mapping as well as morphology, grain boundaries and defect studies, including regional heterogeneity investigations and discrimination of material. Since conventional x-ray diffraction has lateral resolution in the range of mm² and information depth of > 1 μm even in the case of grazing incidence, EBSD can be a powerful tool to examine PVD coatings with ultra high spatial resolution. Up to now, EBSD is a standard method for crystallographic examination of bulk materials. In the present case, the potential of EBSD to examine PVD coatings based on CrN was examined. Main focus of EBSD analyses was to identify coating effects on crystal growth near surface imperfections. Therefore, CrN coatings were deposited on Si (111) wafers as well as onto low alloy carbon steel substrates. Because EBSD is an extremely surface sensitive method with information depth of apprx. 15 nm the influence of sample and surface preparation on EBSD signal quality was examined entirely. Beyond this, variation of BIAS voltage was applied to the CrN coatings to examine the effect on texture and crystallinity. Additionally, the effect of the substrate crystallographic orientation and substrate surface pretreatment on the crystallographic orientation of CrN coatings was investigated.

Keywords
EBSD
Crystallographic microstructure
Chromium nitride
Coating
Kikuchi bands