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(Faculty of Science Common Room, Agricultural Central Building)

## Study the structural changes in CrAlN coatings by in-situ synchrotron radiation X-ray diffraction

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The crystal structure of hard CrAlN coatings at high temperature was determined using high resolution in-situ synchrotron radiation x-ray diffraction (SR-XRD) technique in temperature range of 25 °C - 700 °C. Analysis of the SR-XRD data showed multiple crystal phases with significant changes in structure of the phases, as the temperature was increased up to 700 °C. The dominant phase of the coating material was CrN in the NaCl B1 structure. The existence of Al affected the lattice constant of CrN which indicates the formation of solid solution. Below 600 °C, coatings demonstrate remarkable structural thermal stability. However, formation of face-centered cubic Cr along with Al<sub>2</sub>O phases at about 700 °C can be considered as the onset a phase transformation. Results were implemented in first-principles calculations to predict the mechanical properties of the coatings at high temperatures.

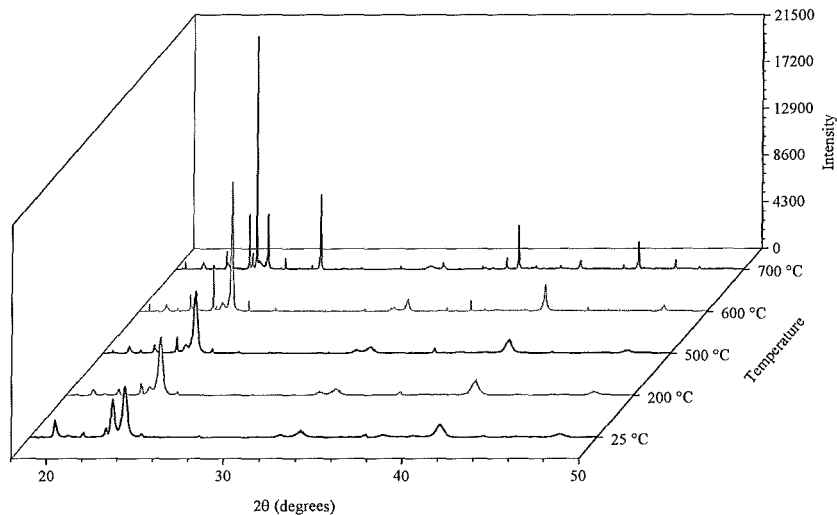


Figure 1. Diffraction patterns of  $Cr_{0.47}Al_{0.53}N$  coating at different temperatures