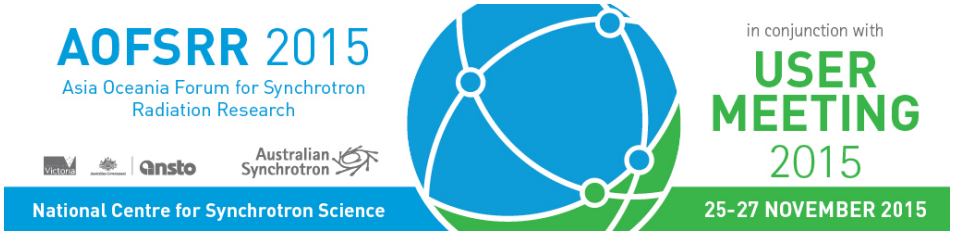

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High temperature structural properties of CrAlTiN coatings from in-situ Synchrotron Radiation X-ray Diffraction

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This paper describes thermal stability of CrAlTiN hard coatings, deposited by magnetron sputtering technique in temperature range of 25-700 ℃. The microstructure and phase combination of coatings were investigated using in situ synchrotron radiation X-ray diffraction (SR-XRD). Rietveld refinement was carried out on the characterisation of SR-XRD spectra to investigate the structure and phase composition of coatings. The SR-XRD analysis demonstrated that CrN is the dominant phase below 700 ℃. Solution of Ti and Al in CrN changed the preferential growth orientation of the coating material and indicated the complex structure of the coating in shape of crystalline CrTiAlN solid solution surrounded by amorphous AlN matrix. Domain size and strain of CrN crystallite in both coatings at different temperatures were estimated. The high quality crystalline data obtained from this study provides deeper understanding of the non-structural and thermal stability of CrAlTiN nanocomposite. Obtained data also offers feasibility to simulation mechanical properties at high temperature using computational modelling, such as Density Functional Theory.

Keywords

hard coatings, thermal stability, synchrotron, rietveld refinement

Primary author(s) : Mr MOHAMMADPOUR, Ehsan (School of Engineering & Information Technology, Murdoch University, Murdoch, WA 6150, Australia)

Co-author(s) : DLUGOGORSKI, Bogdan Z. (School of Engineering & Information Technology, Murdoch University, Murdoch, WA 6150, Australia); Dr ALTARAWNEH, Mohmmednoor (School of Engineering & Information Technology, Murdoch University, Murdoch, WA 6150, Australia.); Mr MONDINOS, Nicholas (School of Engineering & Information Technology, Murdoch University, Murdoch, WA 6150, Australia); Dr JIANG, Zhong-Tao (School of Engineering & Information Technology, Murdoch University, Murdoch, WA 6150, Australia)

Presenter(s) : Mr MOHAMMADPOUR, Ehsan (School of Engineering & Information Technology, Murdoch University, Murdoch, WA 6150, Australia)

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