Face-Centered Cubic and corundum (Al\textsubscript{1-x}Cr\textsubscript{x})\textsubscript{2}O\textsubscript{3} Thin Films: Deposition, Characterization, and Heat Treatment Studies

Ali Khatibi\textsuperscript{1}, Axel Genvad\textsuperscript{2}, Per Eklund\textsuperscript{1}, Lars Hultman\textsuperscript{1}

\textsuperscript{1}Linköpings universitet, Linköping, Sweden \textsuperscript{2}Sandvik Tooling AB, Stockholm, Sweden

alikh@ifm.liu.se

Face centered cubic (fcc) and corundum (Al\textsubscript{1-x}Cr\textsubscript{x})\textsubscript{2}O\textsubscript{3} solid solution films have been industrially deposited by cathodic arc deposition technique from alloyed targets with different Al and Cr contents. The film growth took place at substrate temperature of 550±10 °C and substrate bias of -60 to -120 V in a pure oxygen atmosphere. The depositions are made on WC and Si substrates. The mechanical properties of the films like hardness and elastic modulus are correlated to their structure and compositions. The subsequent annealing studies on both fcc and corundum solid solutions are performed for temperature range of 550 to 1100 °C and annealing time of 2-10 h. A gradual phase transformation to corundum is observed for the fcc films starting at 900 °C. For the same range of annealing temperatures and times, there is no indication of any phase separation into a-Cr\textsubscript{2}O\textsubscript{3} and Al\textsubscript{2}O\textsubscript{3} for the corundum (Al\textsubscript{1-x}Cr\textsubscript{x})\textsubscript{2}O\textsubscript{3} solid solution films. The mechanical and structural properties of the annealed films are investigated.

Keywords
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