

CrNx films prepared using feedback-controlled high power impulse magnetron sputter deposition

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ABSTRACT

A feedback-controlled high power impulse magnetron sputter deposition system was used to deposit CrNx thin films in a reactive mode. The plasma emission intensity of Cr at 358 nm was monitored and the amount of the reactive gas of N₂ was precisely controlled to have a stable emission intensity during the deposition process. By controlling the N₂ input, giving different Cr 358 nm (neutral state) emission intensities, various CrNx thin films were obtained at a fixed duty cycle of 4.5% under a stable reactive mode. The characteristics and the mechanical properties of the obtained films were also investigated. The results show that a Cr emission intensity at 40% relative intensity between pure metal deposition (100%) and fully poisoned deposition (0%) has the highest hardness and the elastic modulus of 29 and 357 GPa, respectively. Besides, the lowest friction coefficient, lowest corrosion rate, and highest corrosion resistance were also observed.

Keywords: CrNx, HiPIMS, PID feedback

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