



Development and study on continuous high-power magnetron sputtering (C-HPMS)

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Abstract:

High intensity glow discharge technology such as high-power impulse magnetron sputtering (HiPIMS) has been proven to produce highly ionized metallic deposition particles. The charged ions have nice energy controllability, inducing a large density as well as good uniformity and mechanical properties to the coatings. However, the high impulse discharge is unstable and leads to a significant decrease in deposition rate. In this work, we perform the simulation of high-intensity discharge in C-HPMS and HiPIMS and find that the power density of C-HPMS is much lower than the peak power of HiPIMS to obtain a similar high ionization rate, but the deposition rate of C-HPMS is dozens of times compared to HiPIMS. By this, we developed a new cathode which can bear ultra-high power density for C-HPMS by optimizing the thermal and magnetic distributions. By C-HPMS, the deposition rate of Cu is found to above $2\mu\text{m}/\text{min}$ and the crystal structure is controllable easily. In reactive sputtering of Al, a greatly expand deposition window is obtained and many non-stoichiometric meso-phases can be fabricated with a very high deposition rate. At the same time, owing to the higher metal ionization rate, many hard coatings, such as CrN, TiC, TiAlN, etc., which have a smooth surface and high-density, as well as the similar mechanical performance to the arc ion plating samples, can be obtained by C-HPMS.

Biography:

Zhongzhen Wu is a phd researcher in peking university, China. His research focuses on surface modifications by PVD (including arc, sputtering, etc), ion implantation, and MAO (PEO), etc. The applications are hard coatings, friction, corrosion, thin film solar cells and all solid-state thin film lithium batteries, etc



Publication of speakers:

- Dynamic changes of hydrophobic behavior during icing
Wei Tang, Liangliang Liu, Zhongzhen Wu.
- Pre-lithiated $\text{Li}(\text{Ni}_x \text{Mn}_y \text{Co}_z)\text{O}_2$ nanoparticles with a double-layer lithium structure
Suihan Cui, Qingdong Ruan, Zhongzhen Wu

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