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New approach for arcing mitigation methods

Anna W. Oniszczuk, Wojciech Gajewski, Piotr Różański, Paweł Lesiuk, Paweł Ozimek

TRUMPF Huettinger Sp. z o.o., Zielonka, Poland

Anna.Oniszczuk@pl.trumpf.com

Over last year an interest in High Power Impulse Magnetron Sputtering (HIPIMS) technique have increased significantly. Until now anti-wear and protective coatings prepared by HIPIMS won an established position and are used commercially. Newest market trends show the HIPIMS technology will soon became a standard production tool for oxide coatings, both conductive and non-conductive. In order to keep pace with market development HIPIMS power supplies also require further evolution to meet high productivity, stability and reproducibility demands of the industry. To fulfill these rigorous requirements HIPIMS power supplies must offer versatile arc management, unique control of voltage and current peak shape and the average power delivery control – sophisticated features previously unavailable in any other HIPIMS power supply units.
This contribution is focused on two aspects of HIPIMS technology: (i) arc detection and suppression methods (ii) stabilization of reactive sputtering processes performed with HIPIMS.
The first part will be opened with the description of basic methods for detection of discharge shift from glow to arc type. Two supplementary detection methods based on current and voltage threshold monitoring will be discussed with respect to the suppression time and associated arc energy. It will be shown that application of regulated quasi-rectangular HIPIMS voltage and current pulse shape does not lead to increased probability of arc formation.
Next, based on the results of HIPIMS sputtering using planar Ti and Al targets in mixed Ar with oxygen or nitride atmosphere, it will be shown that combined peak current value and average power control algorithm can be used for stabilization of reactive sputtering processes. The influence of various average power control algorithms on the pulse shape and deposition rate will be discussed

Keywords
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