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Multiple plasma source synchronization for improved process optimization: a Ti-Cr-based anticorrosion coating case study

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As the magnetron sputtering deposition of functional coatings is a common production step used for variety of high-tech and daily-use products, a lot of manufacturers invested much effort into the optimization of this technological step. The optimization itself, is commonly focused on process metrics such as its velocity measured by throughput or effectively judged by the amount of faulty products from one process batch. Plasma power supply is one of the key components required for magnetron sputtering deposition and in many cases a system used for coating deposition uses multiple magnetron sources, thus, more than single power supply. Furthermore, the optimization and development of sputtering processes is often based on application of different plasma generation technology i.e. DC, AC or RF. Thus, it is crucial to develop new algorithms allowing mutual communication of all power supplies used on one system, independently from their working principle or application.
This contribution focuses on a novel approach to power supply operation in sputtering systems equipped with multiple plasma sources. As a model magnetron sputtering system a batch-type coater, with at least four single- or dual-target magnetrons and a negatively biased substrate holder, has been chosen to study the efficiency of synchronized power supply operation. First the concept of configurable exchange of synchronization signal between different generators in the event of arc detection on one of them will be introduced. As next, the results of Ti-Cr-based anticorrosion coating deposition by mixed Bipolar and HIPIMS sputtering will serve to discuss the influence of power supply synchronization on the quality of deposited films. The discussion will be concluded with an analysis of the full system solution approach, where magnetron and bias power supplies are synchronized together for further reduction of faulty products due to arcing.

Keywords
magnetron sputtering
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