Laser and Plasma for Advanced Manufacturing (LPAM)

University of Virginia, Mool Gupta, 757.325.6850, mgupta@virginia.edu
University of Illinois-Urbana Champaign, David Ruzic, 217.333.0332, druzic@uiuc.edu
Southern Methodist University, Radavon Kovacevic, 214.768.4865, kovacevi@lyle.smu.edu

Symmetric Magnet Pack for High Power Pulsed Magnetron Sputtering

Demand for high quality, high performance coatings has increased dramatically over the last few decades due to their application in diverse industries. The automobile, tooling, medical devices and kitchen appliance industries, to name a few, incur very high tooling costs related to performance improvement of coating processes. In recent years, advancements in magnetron sputtering technology have made huge impacts especially in areas like low friction, wear-resistance, corrosion resistance and hardened coatings. High Pulsed Power Magnetron Sputtering (HPPMS) or High Power Impulse Magnetron Sputtering (HiPIMS) is a relatively new and promising pulsed magnetron technology capable of producing high quality, high performance coatings that were not achievable by conventional magnetron sputtering technology.


Currently, the throughput of this breakthrough technology is relatively low. Hence, additional research and development will be required to fully implement it commercially. With the development of the new TriPack magnet pack for HiPIMS by researchers at the Center for Laser and Plasma Advanced Manufacturing (CLPAM), deposition rates in HiPIMS process have been doubled. These deposition rates are directly related
Economic impact: This invention along with the HiPIMS technology should be important for optical coatings where the performance is always plagued by the time spent on the coating process. It has been demonstrated that improved coatings from use of the TriPack magnet pack with HiPIMS technology will achieve exceptional performance leading to longer life times and lower costs. In the tooling industry, drill bits and milling cutters are often coated with titanium nitride or other specially engineered coatings through conventional magnetron sputtering technology. These coatings increase their lifetime by a factor of three or more. With this breakthrough’s new TriPack development in the HiPIMS technology, superior titanium nitride coatings with about 5x more life time can be achieved at 10% lower cost. Because of increased wear-resistance and lower friction properties, coatings on an engine’s camshaft, for example, could help increase the efficiency of engine performance by reducing friction losses by 40%. A patent titled “Method of and Magnet Assembly for High Power Pulsed Magnetron Sputtering” (# 14/878,417) was filed as result of this work. The leading industrial vacuum equipment provider, Kurt J Lesker Company, has plans to sell this magnet pack commercially.

For more information, contact David Ruzic at the University of Illinois, Urbana Champaign, druzic@illinois.edu, Bio http://illinois.edu/lb/article/4547/58107/page=1/list=list?skinId=6413, 217.333.0332.