

Monday Afternoon, April 20, 2026

Keynote Lectures

Room Town & Country A - Session KYL1-MoKYL

Keynote Lecture I

Moderator: Sandra E. Rodil, Universidad Nacional Autónoma de México

1:00pm KYL1-MoKYL-1 **HiPIMS with Cathode Reversal -- Physics and Applications**, **David N. Ruzic** [druzic@illinois.edu], Tag Choi, Nicholas Connolly, University of Illinois at Urbana-Champaign, USA **INVITED**

This talk covers the physics behind, and applications of a high-power impulse magnetron sputtering (HiPIMS) deposition system which allows for the potential of the cathode to be reversed at the end of magnetron pulse. Results from a system which allows for detailed waveform control was first published [1], commercialized [2] and patented [3] at Illinois and has been the subject of numerous investigations. Reversing the cathode potential at the end of a high-power impulse magnetron sputtering (HiPIMS) pulse first turns the magnetron into a Hall-thruster expelling ions and plasma, and then raises the plasma potential allowing the control of the ion energy during the kick to within one eV -- even on insulating substrates. In addition, we will show that the ratio of target ions to gas ions can be controlled by changing the angle of the target with respect to the workpiece. Time-resolved Langmuir probes have been used as a function of position to show how the electron energy distribution evolves from a Maxwellian during the main negative pulse, to a Druyvesteyn during the delay before reversal, and to sub-Druyvesteyn during the positive pulse. The commutation of the potential to the workpiece happens on the micro-second timescale and the attendant dV/dx heats the local electron population leading to enhanced ionization and therefore higher deposition rates. By running the appropriate waveform, a PVD tool can be used as an etcher. These abilities open a wide range of applications for such devices from the ability to make conformal super-conducting films, corrosion barriers for bipolar fuel cell plates, more efficient CIGS solar cells, reduced-stress coatings and room-temperature high-hardness TiN thin films.

[1] Wu B, Haehnlein I, Shchelkanov I, McLain J, Patel D, Uhlig J, Jurczyk B, Leng Y and Ruzic D N, "Cu films prepared by bipolar pulsed high power impulse magnetron sputtering" *Vacuum* **150** 216–21 (2018)

[2] Starfire Industries LLC <http://starfireindustries.com>

[3] US Patents #11,069,515 B2 and #12,211,680 B2

Wednesday Afternoon, April 22, 2026

Keynote Lectures

Room Town & Country A - Session KYL2-WeKYL

Keynote Lecture II

Moderator: Sandra E. Rodil, Universidad Nacional Autónoma de México

1:00pm KYL2-WeKYL-1 **Nanoengineered Materials and Coatings for Medicine and Beyond**, *Krasimir Vasilev* [krasimir.vasilev@flinders.edu.au], Flinders University, Australia

INVITED

In this keynote talk, I will give an overview of recent progress from my lab on development of plasma polymer facilitated nanoengineered surfaces and materials that benefit many areas of application. Over the years, we developed a range of plasma-based methods with allows us to control that entire spectrum of material surface properties, including chemical, physical, mechanical and topographical. The main focus of our research is the design and surface modification of novel medical devices and biomaterials for applications in areas such as tissue engineering, controlling inflammation and infections, drug delivery and medical diagnostics. However, our surface modification technologies are not limited to medicine. We have demonstrated the utility of nanoengineered plasma polymers for solving problems in other areas such as environmental science and remediation, water treatment and even wine making. I will present the engineering and chemical concepts underpinning “plasma nanoengineering” and give a range of examples of application of the technology in various fields, including commercial applications.

Thursday Afternoon, April 23, 2026

Keynote Lectures

Room Town & Country A - Session KYL-ThKYL

Keynote Lecture III

Moderator: Sandra E. Rodil, Universidad Nacional Autónoma de México

12:40pm KYL-ThKYL-1 High Performance Carbon Materials Based on Diamond Glass: Defining Pathways for Their Synthesis, *David R. McKenzie* [david.mckenzie@sydney.edu.au], University of Sydney, Australia **INVITED**

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