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INVITED TALK

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Cathodic arcs and high power pulsed magnetron sputtering: A comparison of plasma formation and thin film deposition

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Session: WS-SuA6	Cathodic Arcs and High Power Pulsed Magnetron Sputtering: A Comparison of Plasma Formation and Thin Film Deposition	Abstract # 1765

Invited Paper

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Abstract:

Film formation by energetic condensation has been shown to lead to well-adherent, dense films. Films are often under high compressive stress, but stress control is possible by pulsed high-voltage biasing, for example. Control of film growth via tuning the kinetic energy of condensing species is most efficient when the condensing species are ions, and when the degree of ionization of the plasma is high. Cathodic arc plasmas are fully ionized; they even contain multiply charged ions. The streaming plasma is supersonic, with kinetic ion energies in the range 20-150 eV, and additional energy can be provided via substrate bias. Ion formation at cathode spots and the dependence of plasma properties on the cathode material will be discussed. Along with ions, macroparticles are produced at cathode spots. This highly undesirable feature can be mitigated by plasma filters and other approaches, however, there is strong motivation to find alternative ways of producing fully ionized plasmas of condensing species. High power pulsed magnetron sputtering (HPPMS) may be one possible way of achieving this goal, at least for some target materials. In HPPMS, the power density at the magnetron target is pulsed to power levels exceeding the average power by about two orders of magnitude. Thermalization of sputtered atoms appears to be needed to accomplish ionization, and self-sputtering during each power pulse may be an important feature of HPPMS.