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Detailed Time-resolved Plasma Diagnostics in a Pulsed DC Magnetron Discharge IAN SWINDELLS, The University of Liverpool, PETER KELLY, Manchester Metropolitan University, JAMES BRADLEY, The University of Liverpool — Mid-frequency (5 - 350 kHz) pulsed DC magnetron plasmas provide a stable, arc free sputtering process for deposition of metal oxide films. A combination of Langmuir probe and optical emission spectroscopy plasma diagnostics provide detailed time-resolved measurements of plasma density, n_e, electron temperature, T_e, plasma potential, V_p, and plasma excitation. The bi-polar waveform of the power supply, in particular the fast transient periods, drives the evolution and energetics of the plasma. Using electrical probes we observe a short lived increase in n_e and T_e during the on to off and off to on phases. This is accompanied by a burst of light in the optical emission. The large overshoot in voltage during the target reversal on to off drives the plasma potential to values of over +150 V relative to ground. Sheath dynamics at the boundaries between the plasma and the target, for the switch to the 'on-phase', and between the plasma and the substrate or walls, during the overshoot period, provide an explanation for the observed peaks. The effect different boundary conditions have on the bursts during the overshoot period is investigated.

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