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Investigation of total energy flux density at a floating substrate in pulsed DC unbalanced magnetron. MARTIN CADA, University of Liverpool, GREG CLARKE, Manchester Metropolitan University, JAMES BRADLEY, University of Liverpool — The total energy flux density (TEFD) at a floating substrate in an asymmetric bipolar pulsed DC unbalanced magnetron system with titanium target has been investigated using a thermal probe (in substrate) and a time-resolved Langmuir probe. It was found that for various pulsing parameters: 1) the TEFD is approximately 70% higher in a pulsing plasma than for DC operation and 2) the total energy flux density increases linearly with pulse frequency and decreases with duty cycle (with maximal value at 60% duty). The EFD for the charged particles (electrons and ions) and neutrals were calculated. The neutral particle flux was determined from the deposition rate. The charged particle energy flux at the floating substrate was calculated from the measured electron mean energy, charged particle concentration, plasma and floating potentials. Finally, the total energy balance was calculated and compared to the TEFD measured by the thermal probe. Good agreement between the measured and calculated TEFD was found for DC and low pulse frequencies. For higher frequencies, the calculated TEFD was observed to be several times lower than measured. We attribute this to the inability of the Langmuir probe technique to measure the high energy electrons and ions generated during the pulse transients.

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