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A novel current-voltage probe technique for plasma diagnostics at a rf biased electrode MIKE HOPKINS, PAUL SCULLIN, BORIS DOLINAJ, DONAL O'SULLIVAN, DAVID GAHAN, Impedans Ltd, RESEARCH TEAM — Current-voltage probes are used to monitor the voltage, current and phase angle of the RF power used to generate a plasma or to bias a substrate. A key feature is that these sensors work in non-50Ω environments. This allows the sensor be placed post-match and make accurate measurements when the impedance phase is close to 90°. Some of the most important plasma parameters for surface modification in plasma reactors are the flux and energy of ions arriving at the substrate. The ion flux is difficult to establish in deposition tools (as the plasma often deposits insulating layer) or when non-conducting electrodes are used. We report on a novel IV sensor, which is placed post-match in series with a capacitively coupled RF biased electrode. The sensor integrates the current into voltage bins. We show that the resulting characteristic represents the real current-voltage (IV) characteristic of the electrode. The measured IV trace is similar to a DC Langmuir probe trace and we determine the ion flux to the biased electrode. We compare ion flux measured with the IV probe to the ion flux determined with a calibrated retarding field analyzer (RFA) placed on the electrode. Other parameters such as electron temperature and plasma potential are calculated and compared with RFA and Langmuir probe measurements.

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