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Measurements of the energies of negative ions produced in processing plasmas DAVID SEYMOUR, CLAIRE GREENWOOD, SEAN DAVIES, ALAN REES, Hiden Analytical, HIDEN ANALYTICAL TEAM — The quality of the thin oxide films deposited on a variety of materials during exposure to plasmas containing oxygen depends strongly on the identity and energies of the negative oxygen ions arriving at the growing films. There have, however, been few experimental studies in which these ion energies have been measured and the available data is markedly less abundant than for the corresponding positive ions. We discuss reasons for the lack of data and suggest suitable techniques for obtaining energy distributions for mass identified ions for a variety of plasmas, including both steady-state and pulsed DC and RF plasmas. For asymmetric RF plasmas the distributions depend on the relative dimensions of the sheath regions in front of the discharge electrodes, whereas for DC magnetron systems a dominant parameter is the voltage applied to the magnetron cathode, particularly when this is pulsed. Sample data for O-, O2-,and O3- ions are shown for mixtures of oxygen and argon for a number of systems including a DC plasma system in which the ions were sampled through an orifice in the anode electrode, and a small magnetron device for which the ions arriving at a grounded substrate were observed.

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