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Real time model based control of an inductively coupled plasma BERNARD KEVILLE, MILES TURNER, NCPST, Dublin City University, PRECISION STRATEGIC RESEARCH CLUSTER TEAM — Process yield in many plasma assisted processes may be improved significantly by real time, closed loop control of certain plasma species. This presentation describes a control algorithm for the closed loop control of a low pressure, inductively coupled plasma simulation. The simulation consists of a global model of the plasma chemistry coupled to an equivalent circuit. The equivalent circuit incorporates an impedance matching box and a model of power coupling from the antenna into the plasma which has been derived from the wave equation and the two term solution to the Boltzmann equation. In addition, mass flow controller models and gas flow transport delays are included. This work indicates how a control algorithm may be determined from a control-oriented model of the process (model-based control) in order to guarantee a robustly stable closed loop response. In general, process parameters such as wall sticking coefficients are difficult to estimate and may change over time and process measurements may be noisy and indirect. This work will indicate how an optimal state estimator may be used to improve estimates obtained from noisy data and how such estimates may be used to adapt the control algorithm in real time in order to guarantee process stability despite changes in process parameters.

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