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**Using the Multipole Resonance Probe to Stabilize the Electron Density During a Reactive Sputter Process** MORITZ OBERBERG, TIM STYRNOLL, STEFAN RIES, STEFAN BIENHOLZ, PETER AWAKOWICZ, Ruhr-University Bochum, INSTITUTE OF ELECTRICAL ENGINEERING AND PLASMA TECHNOLOGY, RUHR-UNIVERSITY BOCHUM TEAM — Reactive sputter processes are used for the deposition of hard, wear-resistant and non-corrosive ceramic layers such as aluminum oxide ($Al_2O_3$). A well known problem is target poisoning at high reactive gas flows, which results from the reaction of the reactive gas with the metal target. Consequently, the sputter rate decreases and secondary electron emission increases. Both parameters show a non-linear hysteresis behavior as a function of the reactive gas flow and this leads to process instabilities. This work presents a new control method of $Al_2O_3$ deposition in a multiple frequency CCP (MFCCP) based on plasma parameters. Until today, process controls use parameters such as spectral line intensities of sputtered metal as an indicator for the sputter rate. A coupling between plasma and substrate is not considered. The control system in this work uses a new plasma diagnostic method: The multipole resonance probe (MRP) measures plasma parameters such as electron density by analyzing a typical resonance frequency of the system response. This concept combines target processes and plasma effects and directly controls the sputter source instead of the resulting target parameters.

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