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Tuning and biasing techniques for multiple frequency capacitive plasmas in ferromagnetic PVD applications and their effect on film quality EGMONT SEMMLER, STEFAN BIENHOLZ, PETER AWAKOWICZ, Institute for Plasma Technology, Ruhr-University Bochum, TIM BALONIAK, ACHIM VON KEUDELL, Workgroup Reactive Plasmas, Ruhr-University Bochum — Multiple frequency capacitively coupled plasmas (MFCCP) are a well-known tool for large area etching or PECVD purposes. In contrast, they are rarely used in physical vapour or reactive sputter deposition. However, they provide an interesting alternative for thin film deposition of special systems like ferromagnetic materials. In this work we discuss a dual frequency discharge with excitation frequencies in the VHF and HF band. The influence of various external parameters like applied power ratio and relative phase on plasma properties is studied using a voltage-current probe, a Langmuir probe, phase resolved optical emission spectroscopy (PROES) and a plasma series resonance (PSR) current sensor. These data are compared to simulation results. Deposition experiments with pure iron (Fe) and nickel (Ni) targets using a new arbitrary waveform substrate bias for dedicated ion energy control have been performed. Resulting film properties are correlated to different bias voltage waveforms. Additionally, results are compared to similar findings in reactive deposition of alumina.

Egmont Semmler
Institute for Plasma Technology, Ruhr-University Bochum

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