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## **The Multipole Resonance probe as a real-time in-situ plasma diagnostic for process monitoring and control**

Moritz Oberberg, Geoffrey Mellar, Maria Dell, Peter Awakowicz

Ruhr-Universität Bochum, Bochum, Germany

oberberg@aept.rub.de

Based on the concept of active plasma resonance spectroscopy (APRS) the Multipole Resonance Probe (MRP) has been introduced as a diagnostic tool for electron density measurements. It takes advantage of the fact that electrons can resonate near the electron plasma frequency. In recent years efforts in modeling, simulation, and experiments lead to advances in understanding and design of the MRP.

In this contribution, the probe is applied to industrially relevant processes such as sputtering. Due to the ceramic tube surrounding the probe, the MRP is insensitive against dielectric coatings and can be adapted as a highly functional and fast diagnostic system for such deposition processes, where other diagnostics, e. g. Langmuir probes, fail. It can be used for real-time electron density monitoring and has been tested in control loops to stabilize deposition processes, e.g. reactive sputtering. This process suffers with surface dependent instabilities. The appearance of ambiguous working points can be controlled by use of the MRP and the introduction of a special precontroller unit. Additionally, a new electronic concept is introduced to deal with the real-time requests of control applications to balance plasma parameters. The MRP is a realization of the vision to build up process controls based on plasma diagnostic.

### **Keywords**

MRP

plasma diagnostic

plasma monitoring

control

sputtering