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Hysteresis and E-mode to H-mode Transition in a MEMS Device, Low-pressure, Microwave Driven Microplasma[1] PATRICK HERMANNS, Institute of Electrical Engineering and Plasma Technology, STEPHAN WESTERDICK, Institute of Electronic Circuits, SIMON BOEDDEKER, PETER AWAKOWICZ, Institute of Electrical Engineering and Plasma Technology — Recent advances in miniaturization technology allow the shrinkage of measuring methods to small scale, sensor size (lab-on-a-chip device). Miniaturized mass spectrometers need an integrated ionization source. Requirements of miniaturized ionization sources are an elevated working pressure and excellent ion beam coupling. In this work, the authors present a MEMS fabricated plasma source integrated into a mass spectrometer. A conducting silicon antenna couples the microwave power into the plasma chamber. The electrons are extracted from the plasma volume by a 20 um x 300 um slit and an applied extraction voltage. Extracted electron currents are measured with a highly sensitive amperemeter. Electron densities and gas temperatures are measured by absolutely calibrated optical emission spectroscopy and small admixtures of nitrogen. A power variation leads to a hysteresis curve of the extractable electron currents and electron densities. It is proposed, that a mode transition from a capacitive E-mode to an inductive H-mode is performed with an increase of generator power. Changes in gas temperature during a mode transition supports the assumption of different energy coupling mechanisms.

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