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Investigation of Negative Ion Production in an Ar/CF4 Matrix-ECR Plasma Source with Transversal Magnetic Filter PIERRE BAELE, MIHAI DRAGHICI, EUGEN STAMATE, Risoe DTU, Technical University of Denmark, PLASMA PROCESSING COLLABORATION — Dry etching performed in plasma discharges is a key process in micro- and nanoelectronics industry. Recently, a considerable effort was dedicated to develop negative ion sources as an alternative solution for low-damage silicon etching using negative ions instead of positive ions. Despite of this interest, no plasma source using negative ions for etching at standards required in the processing industry has been developed so far. This work is reporting on negative ion production in Ar/CF4 matrix-ECR plasma with a transversal magnetic filter. Mass spectrometry and probes are used for plasma diagnostics. A 4x3 matrix configuration of individual ECR plasma cells produced by Boreal Plasma is mounted at the top of a cubic chamber. Each cell includes a water cooled permanent magnet that provides a localized magnetic field necessary for electron cyclotron resonance. A water cooled magnetic filter is used to reduce the electron temperature. The negative ion spectrum is dominated by F- and it depends on pressure, discharge power and Ar/CF4 ratio. The density ratio of negative ion to electron was less than 3 for 3 mTorr in a power range up to 1800 W and reached 15 for 9 mTorr. Etching rates by positive ions and negative ions are reported for different discharge parameters.

Eugen Stamate
Technical University of Denmark

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