

## Mass Filtered Plasma FIB

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### ABSTRACT

We describe a mixed gas mass filtered plasma ion source and column that is capable of delivering single or mixed gas plasma generated ions. Gases for the RF powered ion source can be pre-mixed or of variable stoichiometry by mixing individual gases. The gas mixtures can contain a variety of elements providing light to heavy gaseous ions which can be selected by mass filtering. Optimization of the plasma source consists of varying parameters such as the RF power, pressure, and gas stoichiometry. Subsequently, the mass filter/plasma-gas ion column can be optimized for a wide range of applications. For example, high resolution imaging using light ions (e.g. for subsurface imaging) or fast material removal using heavy ions may be accomplished across a wide range of beam currents, typically 10pA to 10 $\mu$ A, with the same gas mixture. Energy spread ( $\Delta E$ ) and reduced brightness values for typical species of interest ( $\text{He}^+$ ,  $\text{Ar}^+$ ,  $\text{Xe}^+$ ,  $\text{He}^+$ ,  $\text{O}_2^+$ ,  $\text{N}_2^+$ ) in a mixed gas application are presented .