

Function Of Suppressor To Control Ion Beams Emitted In LMIS (Liquid Metal Ion Source)

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The liquid metal ion sources(LMIS) in the focused ion beams(FIB) have many advantages of high current density, high brightness, and low ion energy spread. Gomer suggested the field ionization mechanism considering that the effect of space charge is so significant that a surface field high enough to allow field evaporation(i.e., $\gg 1 \text{ V/\AA}$) cannot be sustained even for emitter radii $\ll 20 \text{ \AA}$. Now the field evaporation is the one that is generally accepted as the dominant ion formation mechanism with the protrusion models by many authors. The field evaporation mechanism needs enough electric field intensity for the ions to be emitted.

We have investigated the proper suppressor position for the emission of liquid metal ion beams. Here the suppressor electrode has been first located between the extractor and source-tip. Secondly the suppressor is located at the same horizontal line as the end of the source-tip, then the suppressor is finally located above the tip-end. Also we have observed the current-voltage (I-V) characteristics under the varying extracting voltage with floated suppressor voltage, and under the varying suppressor voltages with fixed extractor voltage. It is shown that the liquid gallium ion beams are well emitted for the suppressor location above the tip-end and they are efficiently controlled by adjusting the suppressor voltage rather than the extractor voltages.