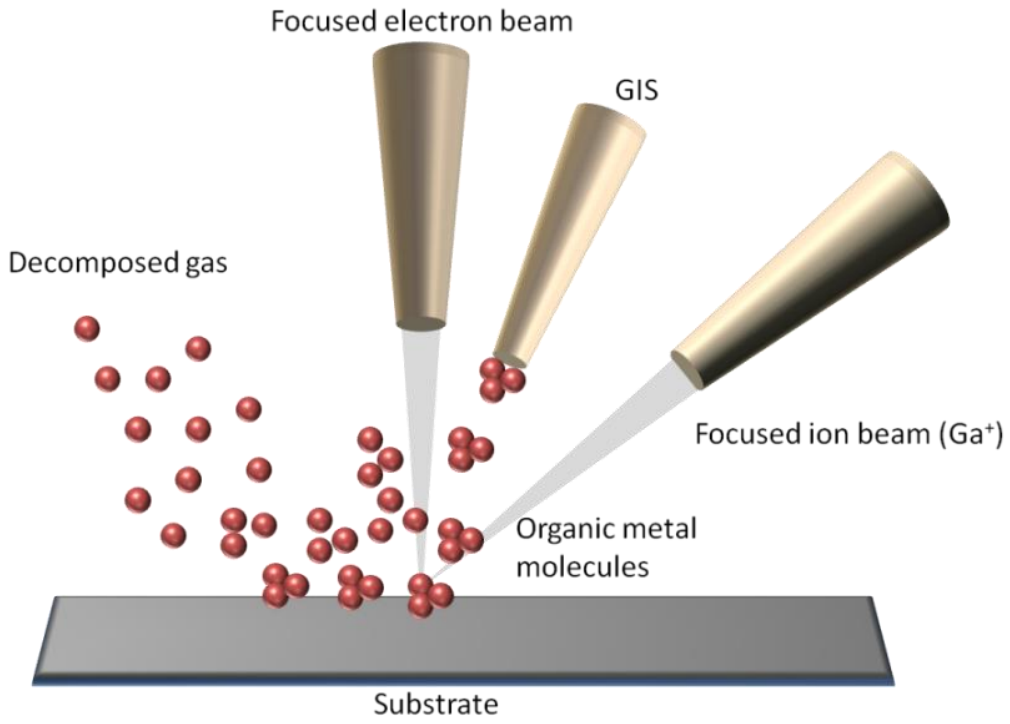
Focused Ion Beam (FIB) Milling

Instrumental Technique

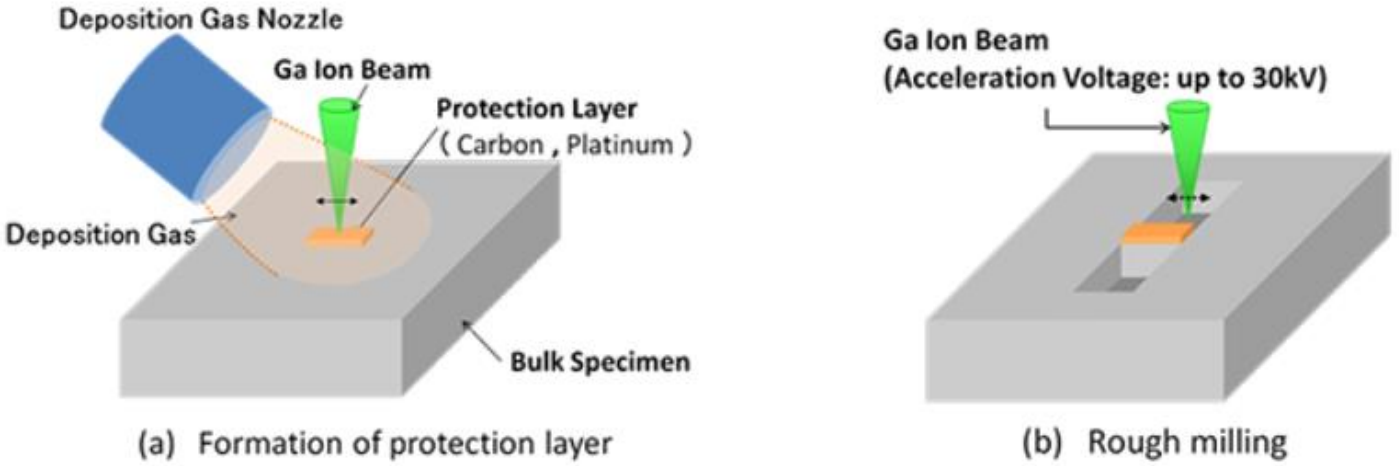
Group Meeting

06-04-19



- Ankit Nagar

Working principle



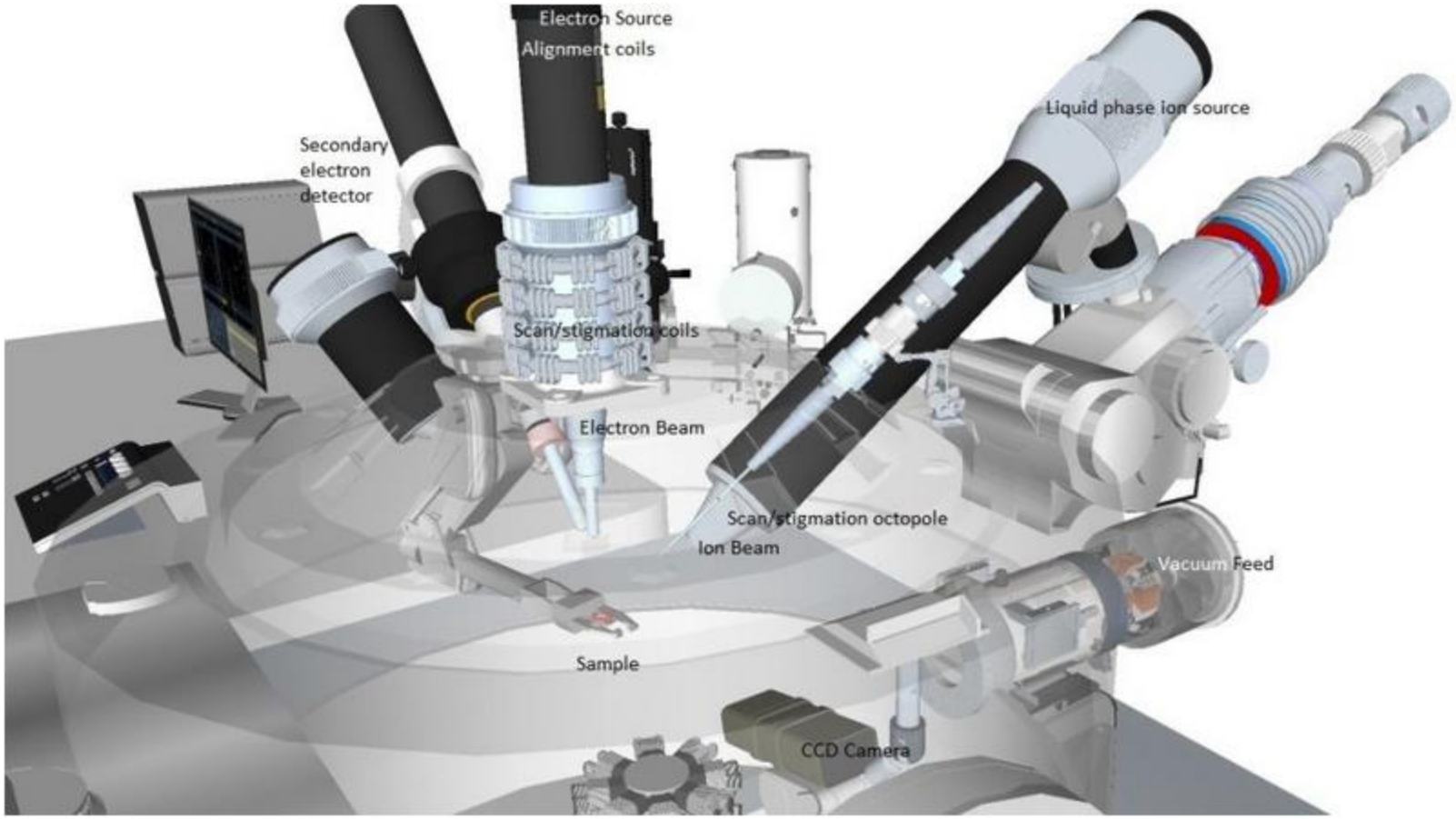
1. Adsorption of gas molecules on the substrate

2. Interaction of gas molecules with the substrate. Formation of volatile and non-volatile species.

3. Evaporation of volatile species and sputtering of non-volatile species.

https://www.jeol.co.jp/en/words/emterms/search_result.html?keyword=focused%20ion-beam%20milling

The FIB system



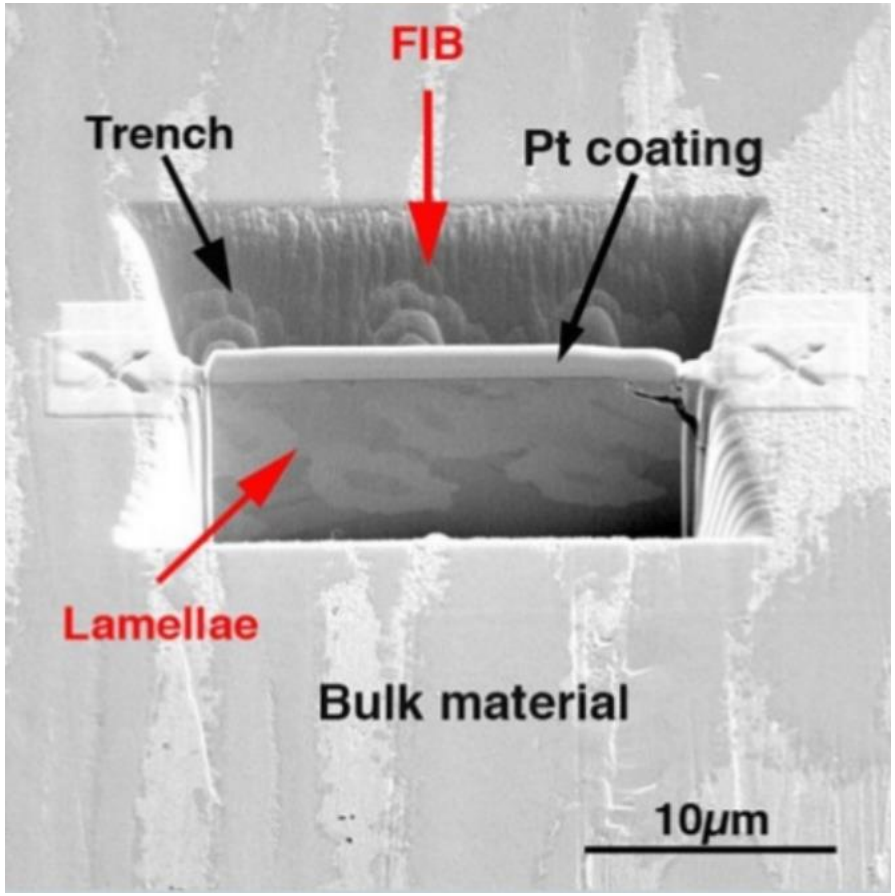
https://www.intechopen.com/books/modern-electron-microscopy-in-physical-and-life-sciences/focused-ion-beams-fib-novel-methodologies-and-recent-applications-for-multidisciplinary-sciences

The source

Gallium (Ga^{+}) is the preferred source material because:

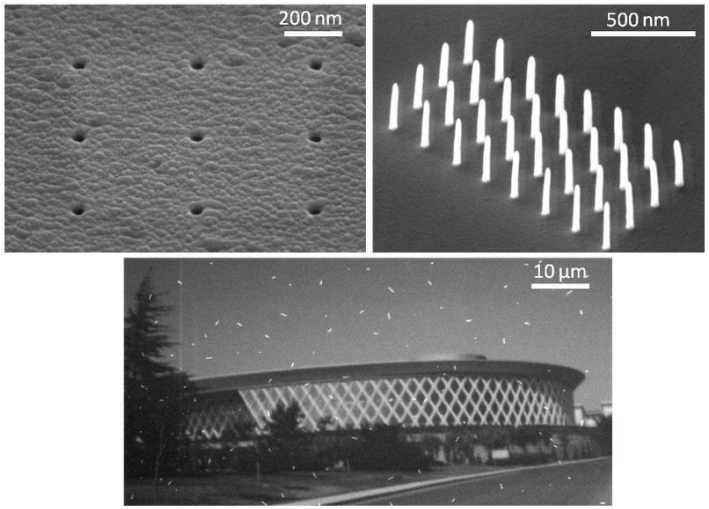
- Low melting point ($29.8^{0}C$)
- Long-lived (500-1500 hrs)
- Low vapor pressure
- Excellent mechanical, electrical and vacuum properties

The sample: post-milling

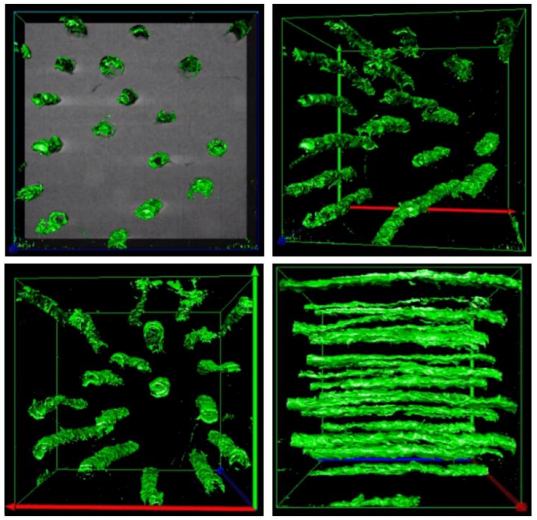


http://www.physics.utah.edu/Phys5739/lecture/feiBasicFIB.pdf

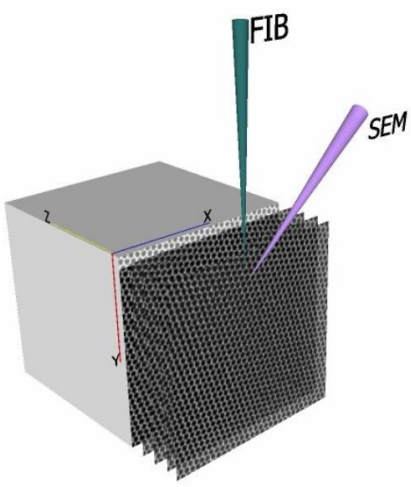
Applications



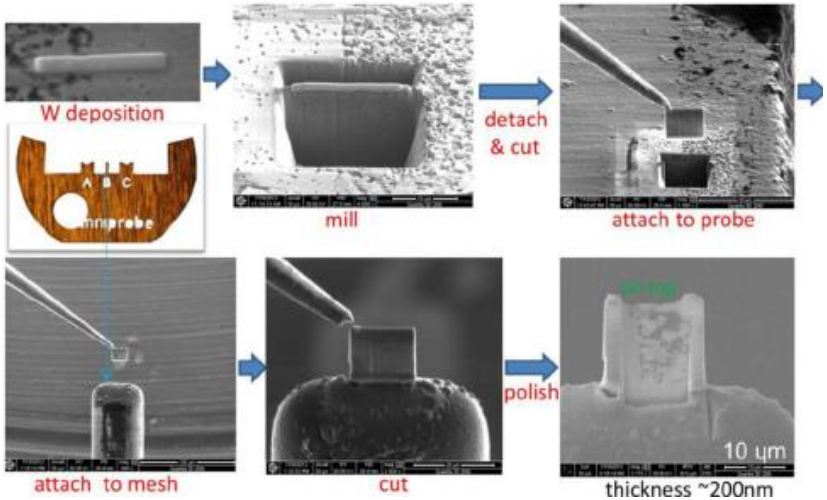
Nanostructuring, nano-fabrication and maskless ion lithography



3D reconstruction of dentin showing the tubule distribution:



Serial slicing and imaging



Sample preparation for TEM

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THANK YOU