FIB alternative patterning schemes and non-classical Liquid Metal Ion Sources

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In this presentation we will review and discuss some new applications of non-Gallium ion Liquid Metal Ion Sources and beams, their interest and relevance to current nanoscience challenges.

In the pursuing quest aiming at investigating the full applied potential of the direct-write Focused Ion Beams technology, there has been a major effort invested around the world aiming at developing alternative ion sources. As a complement to the development of high current sources or atomic-sized emitters it remains our opinion that high performance Liquid Metal Ion Sources and Liquid Metal Alloys Ion Sources exhibit definitive advantages at the prototyping level [1].
Indeed their remarkable brightness, excellent emission stabilities (current emission and emitting area invariance), ease of operation and lifespan remains chief's arguments.
Adding to these there an already large number of ion species available to LMIS and therefore to FIB applications via alternative schemes [2].

In this presentation we will show that FIB patterning is fully compatible with "bottom-up" or "organization" processes, detail some elements of the applicative panorama allowed by these sources when implemented in a nano-writer architecture and illustrate with examples the "bottom-up" or "organization" processes that are now possible:

- Selective epitaxy of semiconductor dots or Nano wires (NWs)
- Induced surface organization
- Creation of color centers in diamond

[1] L. Bruchhaus et al., Appl. Phys. Rev. 4, 011302 (2017); https://doi.org/10.1063/1.4972262
[2] L. Bischoff, P. Mazarov, L. Bruchhaus, and J. Gierak, Appl. Phys. Rev. 3, 021101 (2016). https://doi.org/10.1063/1.4947095