Field emission from single-crystal diamond nano-needles in NC AFM

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We fabricate an NC AFM sensor by fixing a single-crystal diamond nanoneedle (DN) to a length-extension quartz resonator (see Figure 1). Previously, the DN's were used successfully for NC AFM imaging [1]. We use NC AFM to explore the behaviour of DN tips in the field emission regime. Earlier, it has been demonstrated that a strong field emission varies the conductivity of a DN by covering it with a layer of amorphous carbon, sometimes even leading to the growth of a carbon nanostructure at the DN apex that acts as a quantum dot [2]. Our work explores the potential of DN's for application in scanning quantum dot microscopy (SQDM) [3].

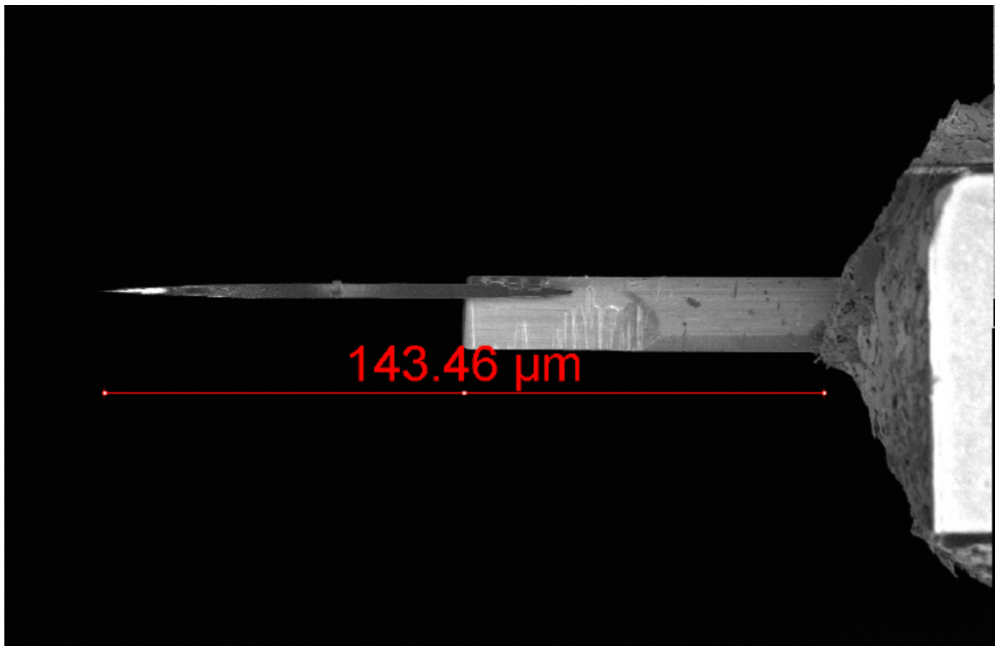

Figure 1. The figure shows a single-crystal diamond nano-needle welded by a focused ion beam to a PtIr wire, which is glued to the length-extension quartz resonator.

Reference

[1] A. N. Obraztsov, et al. Rev. Sci. Instrum. **81**, 013703 (2010).

[2] V. I. Kleshch, et al. Carbon **171**, 154 (2021).

[3] C. Wagner, et al. Phys. Rev. Lett. **115**, 026101 (2015).