Scanning probes with integrated field emission electron source

For nano-lithography as well as for electron based analytics at the nanoscale our R&D department is developing scanning probes with an integrated field emission electron source at the apex of the scanning tip. The field emission source consists of a sharp metallic needle and a ring-shaped gate electrode. For the integration of these electrodes into the scanning probes by micro fabrication methods the tip and cantilever shape is modified significantly. The apex of the tip is defined by the ring-shaped, flat gate electrode and an hole where the emitter is located. The cantilever beam is covered by additional metal and insulator layers enabling the impression of high voltages on the emitter electrodes.

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- Fraunhofer Institute of Integrated Systems and Device Technology (IISB), Erlangen, Germany
- University of Münster, Germany
- Atos GmbH, Pfungstadt, Germany

The electron emission of the field emitter has been demonstrated on flat substrates.

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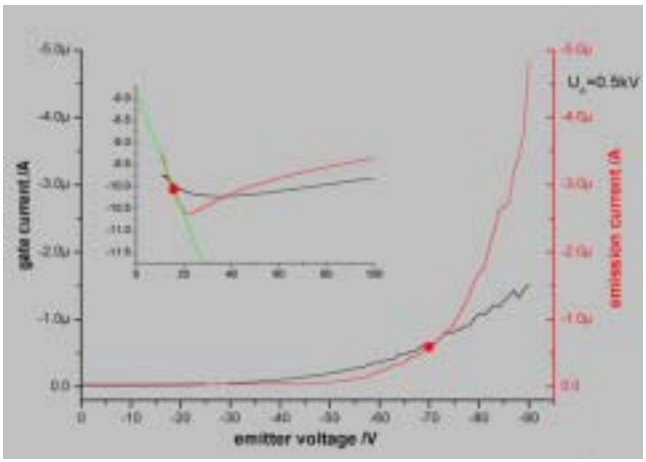
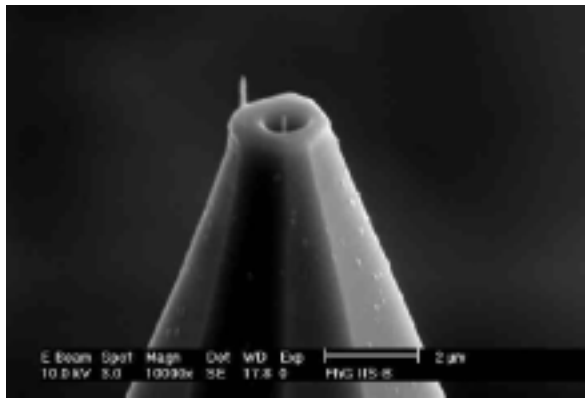
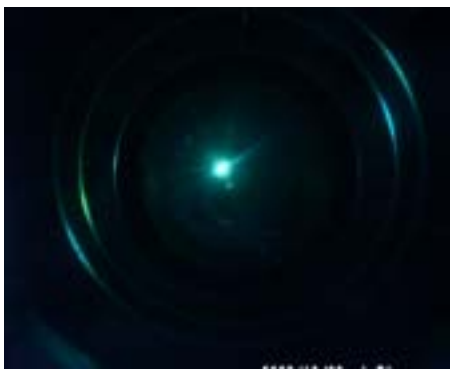
Field emitter probes - images



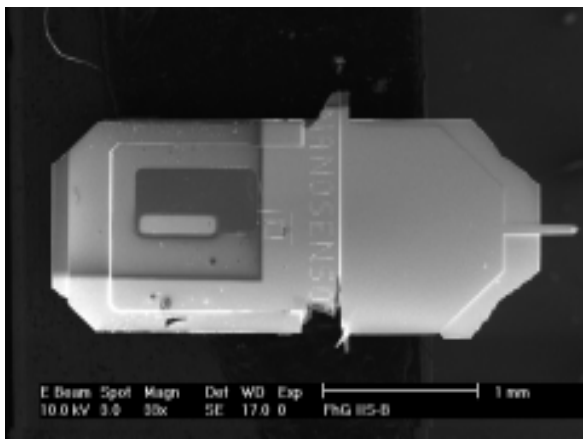
I-V characteristic and Fowler-Nordheim-plot of the field emission source



Silicon tip with integrated emitter and gate electrodes



Video image of the field emission (emitter voltage: 70 V)



Field emitter probe with contact pads for wire bonding