

## **Efficient field emission from structured gold nanowire cathodes**

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Regular patch arrays of random gold nanostructures were fabricated by electrochemical deposition of nanowires in ion track-etched templates. During ion irradiation with GeV ions of fluence  $10^6$ ,  $10^7$ , or  $10^8$   $\text{cm}^{-2}$ , a shadow mask was used resulting in templates structured with square arrays of  $50 \mu\text{m}$  holes and  $100$  or  $150 \mu\text{m}$  pitch. The Au nanowires grown in the track-etched pores had a length of  $7$ – $28 \mu\text{m}$  and a diameter of  $\sim 300$  nm, and were either solitary or clustered after template dissolution. The structured wire ensembles were systematically investigated with scanning electron and field emission scanning microscopy. Field emission with about 90% efficiency was achieved for wide-spaced patch arrays with medium and high number of Au nanowires at  $1500$  V for  $20 \mu\text{m}$  anode distance. The current carrying capability of the patches strongly varied between  $40$  nA and  $90 \mu\text{A}$ . The corresponding processing effects are correlated to adsorbates and nanostructural changes of the wires which give suitable hints for the optimization of structured Au nanowire cathodes.