

## **Field emission properties of copper nanocones grown in polymer ion-track membranes**

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Copper nanocones (Cu-NCs) of about 30  $\mu\text{m}$  length and of  $\sim 2.4 \mu\text{m}$  in base and  $\sim 380 \text{ nm}$  in tip diameter were grown in polymer ion-track membranes. Field emission (FE) properties of two types of cathodes with randomly distributed Cu-NCs were investigated. The unstructured cathode with high number density ( $10^7 \text{ cm}^{-2}$ ) and excellent mechanical stability of Cu-NCs yielded stable currents up to 100  $\mu\text{A}$  at electric fields of about 100  $\text{V}/\mu\text{m}$  as measured with an anode of 30  $\mu\text{m}$  in diameter. The structured cathode with triangular patch array of less Cu-NCs ( $< 10^6 \text{ cm}^{-2}$ ) provided well-aligned FE with about 90 % efficiency at much reduced onset field levels ( $\sim 20 \text{ V}/\mu\text{m}$ ) but lower current limits, too. SEM images of the random Cu-NCs after current processing revealed only slight changes of the tip morphology. The actual status and further optimization steps of structured Cu-NC cathodes for device applications will be discussed.