**AC-driven light emission from in-situ grown organic nanofibers**

Xuhai Liu, Jakob Kjelstrup-Hansen, Roana Melina de Oliveira Hansen, Morten Madsen, Horst-Günter Rubahn
NanoSYD, Mads Clausen Institute, University of Southern Denmark, Alsion 2, DK-6400 Sønderborg, Denmark

In-situ grown organic nanofibers have been prepared on metal electrodes patterned by electron beam lithography (EBL). A systematic investigation shows that the light emission from these nanofibers driven by an AC gate voltage depends non-linearly on the amplitude of the AC gate voltage and linearly on the frequency of the gate voltage, which indicates that a model involving space charge field (SCF) assisted electron tunneling can be applied. The photoluminescence spectra of para-hexaphenylene (p6P) and α-sexithiophene (6T) nanofibers illustrate that the emission color of the in-situ grown nanofibers can be tuned by depositing two types of discontinuous organic layers on the same platform.

---

**AC-driven luminescence**

The light emission obtained by grounding both metal electrodes and applying an AC voltage to the gate indicates that there is no charge carrier transporting between two metal electrodes; rather, the light emission is due to the subsequent injection of holes and electrons from the same metal electrode requiring a sufficiently high field strength to be provided at the electrode edge by the gate voltage.

---

**Bi-layer nanofiber device**

The fluorescence microscope images show a light-emitting device consisting of 3.5 nm p6P in-situ grown nanofibers (a), and the same device after being deposited a second layer with 7 nm 6T nanofibers (b). The inset SEM images illustrate that the 6T nanofibers can be well distinguished from the previously deposited p6P nanofibers.

---

**Summary**

In-situ grown p6P/6T nanofibers on nanoscale electrodes have been used to investigate AC-driven light emission. The emission color of the nanofibers can be tuned by depositing two types of discontinuous organic layers on the same platform.

---

**Future work**

Optimize the nanofiber in-situ growth on nanoscale electrodes in order to achieve a higher growth density. Investigate the influence of the thickness of the two materials on the resulting spectrum.