Tailoring Transport Properties of Polymer-Sorted Carbon Nanotube Networks for Optoelectronic Devices

Prof. Dr. J. Zaumseil
zaumseil@uni-heidelberg.de
Institute for Physical Chemistry & Centre for Advanced Materials, Heidelberg University, Germany

Large amounts of highly purified semiconducting single-walled carbon nanotubes have become available through simple and scalable polymer-wrapping and shear-force mixing in organic solvents. The obtained dispersions enable the deposition (e.g., by aerosol jet printing) of semiconducting nanotube layers with variable thickness from sparse networks to 300 nm thick films with large optical density. These layers can be applied in field-effect transistors with excellent device performance [1], but also as electrochromic filters [2], for light-emitting diodes in the near-infrared [3] and photovoltaic cells [4]. Charge transport and light emission of such nanotube films depend on network composition and temperature [5], and can be tuned further with molecular dopants (e.g., for unipolar n-type or p-type transistors) or light-switchable dipoles. Recent examples will be presented and discussed in terms of tailoring the network properties of polymer-sorted carbon nanotubes and their practical applications in optoelectronics.

References

[1] Rother et al., *Adv. Electron. Mater*. 3, 1700080 (2017).
[2] Berger et al., *ACS Appl. Mater. Interfaces* 10, 11135 (2018).
[3] Graf et al., *Adv. Mater.* 30, 1706711 (2018).
[4] Classen et al. *Adv. Energy Mater.* 9, 1801913 (2019).
[5] Brohmann et al. *ACS Nano*, *13*, 7323 (2019).