SEMINAIRE ISMO

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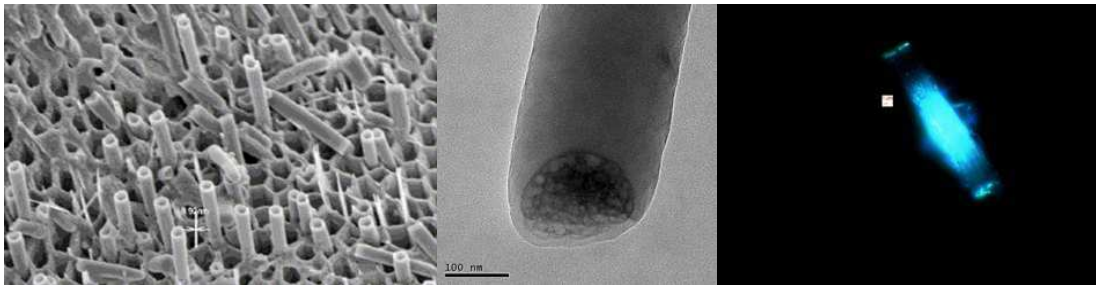
New optical nanomaterials for next generation optoelectronic applications



Using light instead of electrons in future electronic devices will circumvent the problem of substantial heating. Furthermore, ultrafast signal processing can be combined with a high density of information and low noise. Such applications, however, will necessitate new materials and the possibility to combine the macroscopic with a nanoscopic world. In recent years, the successful fabrication of fiber-like structures with macroscopic lengths but mesoscopic widths and heights of some tenths up to mere hundreds of nanometers have been demonstrated including work from our own lab. Such organic nanofibers consisting of self-assembled molecular building blocks exhibit intriguing optical properties such as random lasing, waveguiding or highly efficient frequency upconversion [1-3]. However, the initial fabrication requires elaborate ultra high vacuum techniques.

In order to circumvent this problem we adopted a method initially developed for polymers [4] to molecular based materials and grew uniform organic nanotubular materials in macroscopic quantities from a melt in alumina templates. Lengths of up to 50 µm and aspect ratios of easily more than 300 have been obtained the size being simply limited by the thickness of the membrane. As will be shown, waveguiding within these tubes have been demonstrated although the wall thicknesses involve only a few molecules. The possibility to create new architectures of organic solar cells for optimising their performance as one out of many possible applications will be outlined at the end of the talk.

[1] K. Al-Shamery, H.-G. Rubahn, H. Sitter, “New Organic Nanostructures for next generation devices”, Springer Ser., Mat. Sci. 101, 2008
[2] J. Brewer, M. Schiek, A. Luetzen, K. Al-Shamery, H.-G. Rubahn, Nanoletters, **6** (2006) 2656-2659 "Nanofiber frequency doublers: Second harmonic generation and imaging of nanoscaled organic fibers"
[3] M. Schiek, F. Balzer, J. Brewer, K. Al-Shamery, A. Lützen, H.-G. Rubahn, Small, **4** (2008) 176-181, "Organic molecular nanotechnology" [4] M. Steinhart, R.B. Wehrsporn, U. Gösele, J.H. Wendorff, Ang. Chem. Int. Ed., 43 (11), 1334-1344 (2004)

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