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INVITATION

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speaks

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about

Organic-Organic Hetero-Epitaxy and Implications for the Fabrication of Lasing Nano-Fibers

Motivated by the affinity to form highly crystalline organic nano-needles the epitaxial growth of rod-like molecules e.g. para-hexaphenyl (p-6P) or sexi-thiophene (6T) on various substrates e.g. muscovite-, phlogopite-mica and KCl has been investigated intensively [1-4]. It turned out that p-6P in combination with muscovite mica represents an outstanding material combination [1]. In particular, the low substrate surface symmetry in combination with the resulting molecular alignment is the key to well ordered, parallel aligned nano-fibers providing highly polarized blue fluorescence and laser action [5].

In order to utilize a broader spectrum of molecules for the fabrication of parallel aligned nano-fibers and in particular to shift the lasing wavelength from the blue to the green or red spectral range more complex approaches have to be found [6].

In recent years, heteroepitaxy of organic-organic nanostructures has been demonstrated as a valuable technique to explore the full potential of organic semiconductors for optoelectronic applications. It has been shown that crystalline and highly ordered heterostructures with different morphology and molecular orientations can be realized by heteroepitaxy [7-10]. We demonstrate that organic-organic heteroepitaxy can also be applied to produce multilayered organic nanofibers with high crystallinity, well-defined epitaxial relationship along different materials' phases, sharp molecular azimuthal order, and long-range morphological homogeneity [10]. Based on the latter concept we successfully exploit the fabricated heterostructures to (i) extend the wavelength coverage of nanofiber lasing from the deep blue to the red-orange, and (ii) suppress bimolecular recombination and, thus, achieve nanofiber laser action in the linear (or monomolecular) excited-state recombination regime [11]. The alternated deposition approach with multiple oligomers is also envisioned as a path to nanofiber lasing with ultrahigh bandwidth.

References

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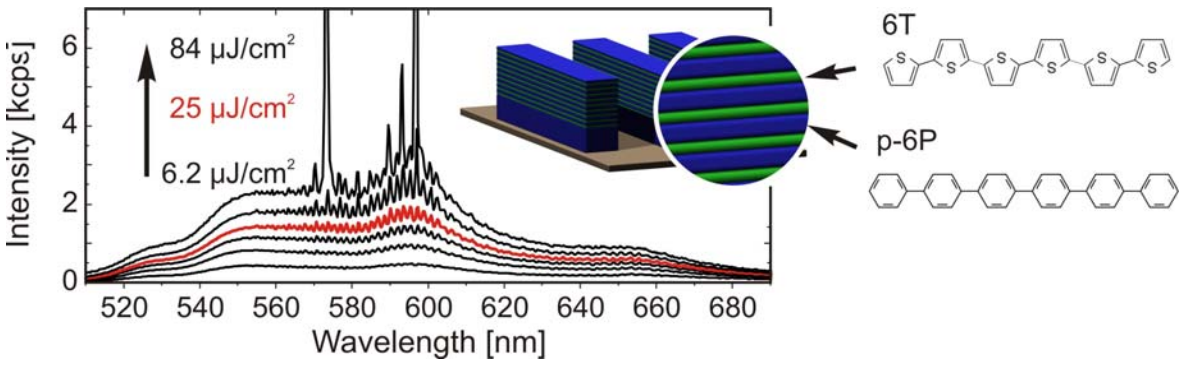

Laser performance of a multilayer nanofibers grown by periodic deposition of p-6P an d 6T (indicated in the inset) on muscovite mica, excited by subpicosecond pulses with 392 nm central wavelength. The emission spectra were recorded at different pump flu ences: 6.2-84 µJ cm^{-2}.

All interested persons are cordially invited.
Sgd. Prof. Manuela Schiek