Invited speech - FLAME SYNTHESIZED ZINC OXIDE (ZNO) TETRAPOD NANOMATERIALS FOR MULTIFUNCTIONAL APPLICATIONS

With wide direct band of ~3.37 eV, hexagonal-wurtzite crystal structure, large exciton binding energy (~60 meV), the ZnO material has been among one of the most pioneering materials towards nanostructuring and large number of applications [1]. A wide variety of nanostructural shapes from ZnO are being synthesized and utilized for several applications. The role of structural aspects, such as complex tetrapodal and multipodal, shape, still needs to be addressed. Inspired by novel capabilities of zinc oxide, we recently developed a new flame based nanostructuring process, called flame transport synthesis (FTS) approach, which offers very simple fabrication of tetrapod shaped ZnO nano- and microstructures in desired quantities. The 3D shape feature enables these tetrapods to be used as unique building blocks for fabricating highly porous interconnected 3D network materials as flexible ceramics which can be used in advanced technologies. These structures can be used as unique fillers to design advanced composite materials. They can be used as solid backbones for synthesizing hybrid porous materials or can also be used as sacrificial templates for growth of new porous 3D tetrapodal networks from various other materials. [1-10].

ZnO tetrapod applications in: (i) Nanoelectronics Sensing, (ii) Optics and Optoelectronics, (iii) Smart 3D Polymer Composites, (iv) Biomedical Engineering, (v) Hybrid and new materials nanostructuring opportunities, such as, Aerographite, carbon nanotubes tubes (CNTT), [1-10] will be briefly discussed in this talk (Figure 1).

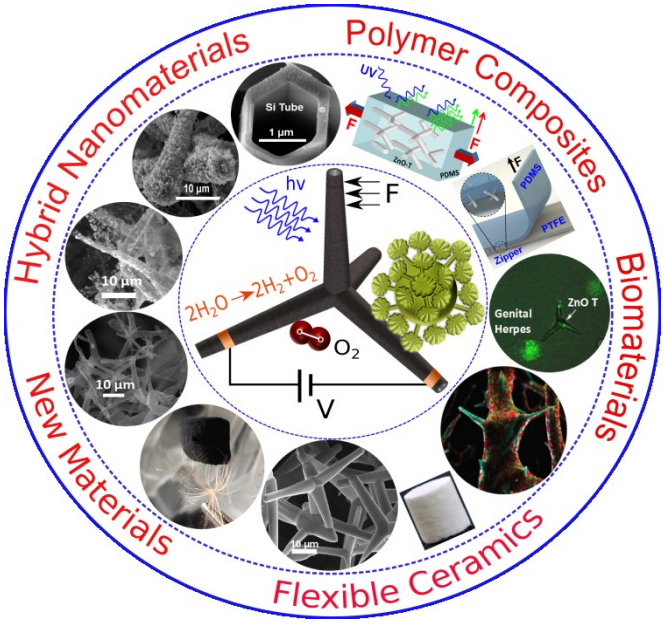

Figure 1: Application scopes of ZnO tetrapod shaped nanostructures in various directions.

[1] Materials Today **2018** (DOI: 10.1016/j.mattod.2017.11.003).
[2] Nature Comm. **2017**, 8, 1215.
[3] Nano Letters **2017**, 17, 6235-6240.
[4] Adv. Funct. Mater. 27, **2017**, 1604676.
[5] J. Immunology 196, **2016**, 4566-4575.
[6] ACS Appl. Mater. Interfaces 7, **2015**, 14303–14316.
[7] Adv. Mater. 26, **2014**, 1541-1550.
[8] Adv. Mater. 25, **2013**, 1342-1347.
[9] Particle & Particle Systems Characterization 30, **2013**, 775-783.

[10] Adv. Mater. 24, **2012**, 3486-3490.

Yogendra Kumar Mishra, Leonard Siebert, Fabian Schütt, Florian Ceynowa, Mona Mintken, Sindu Shree, Daria Smazna, Ingo Paulowicz, Oleg Lupan, Sören Kaps, Rainer Adelung

(Functional Nanomaterials, Institute for Materials Science, Kiel University, Kaiserstr. 2, D-24143, Kiel, Germany)

Contact: ykm@tf.uni-kiel.de