

19th Nano Congress for Next Generation

August 31- September 01, 2017 Brussels, Belgium



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Microtubular NEMS: from concepts to applications

Nanomembranes are thin, flexible, transferable and can be shaped into 3D microtubular nanomembrane architectures. This makes them attractive for a broad range of applications and scientific research fields ranging from novel hybrid heterostructure devices to ultra-compact 3D systems both on and off the chip. If nanomembranes are differentially strained they deform themselves and roll-up into microtubular structures upon release from their mother substrate. Rolled-up nanomembranes can be exploited to rigorously compact electronic circuitry and energy storage units. They can also serve as ideal platform to study novel photonic and plasmonic phenomena. As rolled-up microtubes can be easily tuned into the size range of single cells, they are perfectly suited to study single cell behavior in ultra-sensitive yet fully integrative lab-in-a-tube systems. As off-chip components, they address exciting environmental and biomedical applications such as biomimetic regenerative cuff implants or powerful self-propelling micro-autonomous systems. If magnetic tubes or helices are combined with spermatozoa, such hybrid micro-bio-robotic motors offer new perspectives towards paradigm shifting reproduction technologies.

Biography

Oliver G Schmidt is a Director at the Leibniz Institute for Solid State and Materials Research Dresden, Germany, and holds a full Professorship for Material Systems for Nanoelectronics at the Chemnitz University of Technology, Germany. His scientific activities are focused on nano- and micro-materials and bridge across interdisciplinary research fields, ranging from nanoelectronics and microrobotics to energy storage devices and biomedical applications. He has received several awards: the Otto-Hahn Medal from the Max-Planck-Society in 2000, the Philip-Morris Research Award in 2002 and the Carus-Medal from the German Academy of Natural Scientists Leopoldina in 2005. In 2010, he was awarded the Guinness World Record® for the smallest man-made jet engine and in 2011 he became Honorary Professor at Fudan Shanghai University. He received the International Dresden Barkhausen Award 2013, and since 2014 is the Chair of a new center for "Materials, Architectures and Integration of Nanomembranes (MAIN)". He has published more than 600 papers in peer-reviewed journals and has given more than 250 invited talks worldwide.

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