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Shapeable material technologies – self-assemblying 3D mesoscopic electronics

Electronic devices are continually evolving to offer improved performance, smaller sizes, lower weight, and reduced costs, often requiring state of the art manufacturing and materials to do so. An emerging class of materials and fabrication techniques, inspired by self-assembling biological systems shows promise as an alternative to the more traditional methods that are currently used in the microelectronics industry. Mimicking unique features of natural systems, namely flexibility and shapeability, the geometry of initially planar microelectronic structures can be tailored. Heavily relying on cylindrical geometry, fabrication of microwave helical antennas, coils, resonators and magnetic sensors is challenging, when conventional fabrication techniques are applied. Involving novel self-assembly strategies realization of these spatially non-trivial devices in a compact form and with a reduced number of fabrication steps become feasible. This spatial self-assembly process, triggered by an external stimulus, offers a possibility of an improved performance while reducing overall manufacturing complexity of devices and components by harnessing the relative ease in which it can produce mesoscopic 3D geometries such as a "Swiss-roll" architecture. These benefits can lead to tighter a system integration of electronic components including active electronics, capacitors, coils, sensors and antennas with reduced costs fabricated from a single wafer.

Biography

Daniil Karnaushenko obtained his Dr.-Ing degree in 2016 from the TU Chemnitz (Germany) for his work on shapeable microelectronics. Since 2016 he continued as a senior staff researcher at the IIN (Leibniz IFW Dresden). He was working as a visiting scientist at UT Dallas, Osaka University and Johannes Kepler Universität Linz. His research interests include flexible active electronics, magnetic sensorics, compact self-assembled 3D architectures with a focus on novel microfabrication processes, including self-assembly techniques and shapeable materials technologies.