Two-Dimensional Materials: From Synthesis to Devices and Applications

Doron Naveh

Faculty of Engineering, Bar-Ilan University

doron.naveh@biu.ac.il

The fast evolution of technological advancement drives materials and device research with a demand for ever-faster, energetically efficient, compact electronic devices. Two-dimensional materials are among the most promising platforms for emerging disruptive technologies. However, for several reasons that I describe in my talk the field is considered to be at its infancy in terms of industrial level of readiness. The reasons for this assesement include the materials quality, wafer-scale production of 2D materials and also device fabrication and processing. At this stage and probably for the next decade, the basic and applied research of 2D materials is expected to be very relevant.

In this talk I will survey my ongoing activity in basic 2D materials research, including the role of point defects in semiconductors and insulators; In the methodology development of device fabrication and the utilization of doping and metallization techniques. From the prespective of device applications, the example of on-chip microspectrometers will be discuseed. These devices are electrically tunable photodetectors, having their spectral response modified by voltage biases of the device. Using machine learning and training data they can perform as high-quality spectrometers at resolution of 0.35 nm in wavelength and maximal power deviation of ~4 pW, over the specral range of 400-1100 nm.

Biography

Doron Naveh graduated BSc in physics and materials engineering and MSc in physics from Ben-Gurion University (2001 and 2003, respectively), and PhD from Weizmann Institute of Science (2008) in the field of computational materials science. He was a postdoctoral fellow in Princeton University (2008-2009, theory) and then a second, experimental postdoctoral fellowship at Carnegie Mellon University (2009-2012). From 2012 he is a faculty member in Bar-Ilan Faculty of Engineering, where he is now an associate professor.