

## Nanowire based sensor for manipulating of graphite

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Nanoobject orientation and relocation is a present challenge for building nanoarchitectures. Typical for nanomaterials high surface to volume ratio enhances the role of adhesion at the nanoscale. Adhesion prevents moving of the nanoobjects and complicates their detaching from a substrate. At the same time, it also can contribute to nanoobject relocation process. By varying materials and contacting areas of the object surfaces involved in the process it is possible to balance adhesion interactions between them and to perform successive transfer of the nanoobject from one substrate to another [1].

In this work, application of a single-clamped germanium nanowire for manipulation of a graphite flake is presented. The nanowire was integrated into a 3D nanomanipulation system with step size ranging from nanometers to millimeters, staged inside scanning electron microscope. High adhesion of graphite-germanium interface allowed to detach graphite flakes that are partially delaminated from the graphite surface. Then the nanowire also served as a frequency-shift based mass sensor for weighting of the detached flakes. Flake transfer from the nanowire to the silicon oxide surface was performed similarly to its detachment by adjusting nanowire-flake-substrate adhesion interactions. The presented method is perspective for bottom up approach in creating nanoarchitectures.

### References.

1.J. Kosmaca, J. Andzane, J. Prikulis, S. Biswas, J. D. Holmes and D. Erts, *Sci. Adv. Mater.* **7(3)**, 552 (2015)

Participation in EuroNanoForum 2015 is supported by ERAF project No. 2015/0008/2DP/2.1.1.2./14/APIA/VIAA/004