1 & 2DM Conference and Exhibition
January 29-30, 2019

Karolina A. Drogowska
Petr Kovaříček, Martin Kalbáč
Department of Low-dimensional Systems, J. Heyrovsky Institute of Physical Chemistry, Czech Academy of Sciences, Dolejskova 3, 18223 Prague, Czechia

Karolina.drogowska@jh-inst.cas.cz

Functionalization of the CVD-grown graphene: towards the on-surface chemistry reactions and motion

Controlled tuning of the CVD-grown graphene properties may open the gate for its potential application in optoelectronics, spintronics or sensors. Functionalization [1] or heterostructure formation [2] of the carbon nanostructures is currently considered as the most convenient method for efficient manipulation with their unique properties. It has been shown that the hydrogenation of graphene leads to the opening of the bandgap, enhancement of the spin-orbit coupling and appearance of the magnetic moment. Moreover, the prior hydrogenation of graphene enables its further functionalization with compounds that do not react with pristine graphene [3]. Namely, we have shown using Raman spectroscopy reactivity of the partially hydrogenated graphene with $KMnO_4$, KIO_4, as well as attachment of the benzyl groups due to alkylation with BnBr what was not achieved without the hydrogenation process. Moreover, functionalized graphene can be used as a substrate for the process of the dynamic covalent motion of the fluorescent nanodiamonds (fNDs) using fluorescence microscopy [4]. Multivalent imine linkages formed between aldehyde-decorated nanoparticles and monolayer graphene grafted with amino groups allowed reversible binding–unbinding upon periodic pH changes and oriented motion of the fND in pH gradient.

References

[1] P. Kovaříček, V. Vrkoslav, J. Plšek, Z. Bastl, M. Fridrichová, K. Drogowska, M. Kalbáč, Carbon 118 (2017)
[2] P. Kovaříček, K. Drogowska, Z. Komínková Melníková, V. Blechta, Z. Bastl, D. Gromadzki, M. Fridrichová, M. Kalbáč, Carbon 118 (2017)
[3] K. Drogowska, P. Kovaříček, M. Kalbáč, *Chem. - A Eur. J.*, 23 (2017)
[4] P. Kovaříček, M. Cebecauer, J. Neburková, J. Bartoň, M. Fridrichová, K. A. Drogowska, P. Cígler, J.-M. Lehn, M. Kalbáč, *ACS Nano*, **12** (7), (2018), 7141

Figures

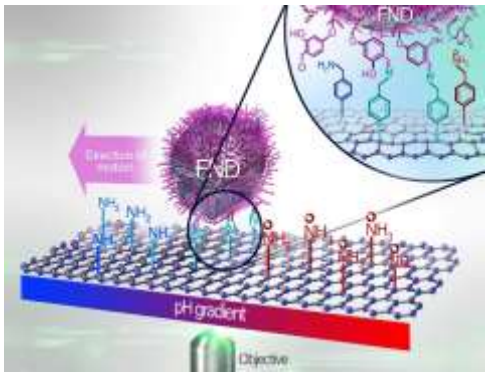

Figure 1: Directional motion of the aldehyde-decorated fND at amino-functionalized graphene as a result of the applying an external pH gradient in a microfluidic channel