# Non-Enzymatic Amperometric Detection of Glucose on Chemical and Mechanical Exfoliated Graphene

**Kirchner E.-M.**
Wunderlich L., Genslein C., Baeumner A. J., Hirsch T.
*Institute of Analytical Chemistry, Chemo and Biosensors,*
*University of Regensburg, 93053 Regensburg, Germany*
*eva-maria.kirchner@ur.de*

Carbon nanomaterials, especially in the 2D modification are highly attractive in chemo- and biosensor development [1]. The absence of a bulk phase provides fast analyte recognition without diffusion limitations. High sensitivity can be achieved by the high surface area and the outstanding electrochemical properties. Up to now it is still challenging to introduce selectivity and to get high reproducibility. The preparation of well-defined, defect-free two-dimensional nanomaterials is mandatory for the development of reproducible sensor devices.

In this study we compare chemical and mechanical methods for the fabrication of colloidal stable graphene dispersion regarding the flake-size distribution, the number of defects and the electrochemical properties.

Graphene prepared by chemical exfoliation can be easy dispersed allowing simple electrode fabrication by drop casting or spin coating [2, 3]. The material suffers from many defects and time-consuming post-treatment is necessary to remove the defects. In contrast, shear force exfoliation combined with liquid cascade centrifugation results in carbon 2D nanomaterials with a low number of defects and defined flake-sizes [4]. Here, difficulties arise in electrode fabrication and in removing the flake stabilizing tensides.

As proof of concept amperometric glucose detection was performed with both types of graphene materials. Selectivity was introduced by electrochemical depositing of Nickel nanoparticles on top of the 2D nanomaterial.

## References

[1] Kostarelos K, Novoselov KS, Nat. Nanotechnol., 9 (2014) 744-745.
[2] Borini S, White R, Wei D, Astley M, Haque S, Spigone E, Harris N, Kivioja J, Ryhänen T, ACS Nano, 7 (2013) 11166-11173.
[3] Wu SW, Parvez K, Feng X, Müllen K, Nat. Commun., 4 (2013), 2487.
[4] Backes C, Szydlowska BM, Harvey A, Yuan S, Vega-Mayoral V, Davies BR, Zhao P, Hanlon D, Santos EJG, Katsnelson MI, Blau WJ, Gadermaier C, Coleman JN, ACS Nano, 1 (2016), 1589–1601.

## Figures

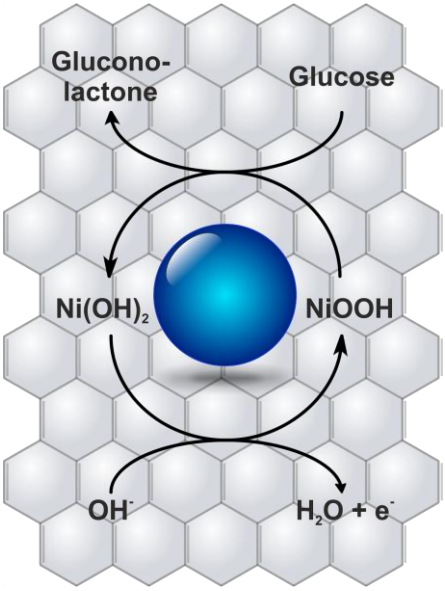


**Figure 1:** Detection scheme of glucose interacting with Nickel nanoparticles modified graphene.