Aspects Behind the Formation of oxo-Functionalized Graphene and Thereout Derived Functionalized Graphene Derivatives

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Oxo functionalized graphene (oxo-G) is a water dispersible 2D-nanomaterial can act as a molecule carrier system or be used as a cheap precursor for conductive graphene layers and is hence of high interest for technical and medical applications. [1]
Up to now, top-down synthesis without additional lattice defects and in a defined flake size distribution remains challenging as well as the functionalization of the intact surface. By applying mild synthesis conditions at temperatures below 5 °C, it is possible to obtain of graphene with densities of defects down to 0.4%, as determined by statistical Raman spectroscopy (SRS) in large yields. [2] At this low rate of defects, the surface chemistry can be precisely studied, avoiding major contributions by functionalization of defect sites and edges.

Here, we present a study elucidating the mechanism behind the formation of oxo-G, as evidenced by experiments and density functional theory calculations (DFT), [3] and show two novel routes towards the synthesis of functionalized graphene derivatives after reduction of oxo-G to graphene.

Furthermore, we qualitatively investigated the influence of the post-processing of oxo-G by ultrasound at defined parameters, which allows the controlled size reduction down to the nanoscale and thus, the usage of the novel materials for biological applications (**Figure 2**). [4]

References

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Figures

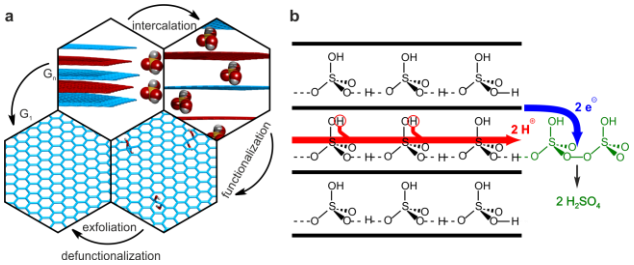

Figure 1: a) Steps of wet chemical transformation of graphite to obtain highly intact graphene flakes. b) H^+ and e^- transport while graphite is transformed to graphite sulfate.

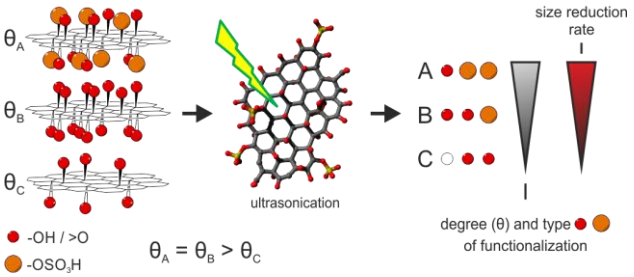

Figure 2: Influence of external stress like ultrasound leads to particle size reduction,