Introducing defects in wet-chemically prepared graphene as structural motifs

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The wet-chemically synthesis of graphene is an ongoing challenge. In particular the complete delamination of the layers of graphite, without destroying the honeycomb lattice, remains difficult. A promising and versatile route is based on oxidative functionalization, allowing delamination of functionalized graphene layers followed by conversion to graphene.
We made rapid progress in the last five years and demonstrated that graphene can indeed be yielded by oxo-functionalization of layers of graphite. The respective graphene possesses mobilities of charge carriers exceeding 1000 cm^2/Vs.[1] However, the quality of graphene is statistically distributed. Here, in this contribution, mechanistic insights into the wet-chemical synthesis are presented, helping to understand the intercalation of graphite (Figure 1).[2] Now, we can produce graphene with a narrow distribution of the quality with the remaining density of defects of about 0.02% in average. Moreover the nature of defects was revealed at atomic resolution (Figure 2).[2][3] With this knowledge, it is possible to benefit from specific defects, such as vacancies, to further manipulate them.[4] Thus, defects can be seen as a structural motif for post-functionalization.[5]

References

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Figures

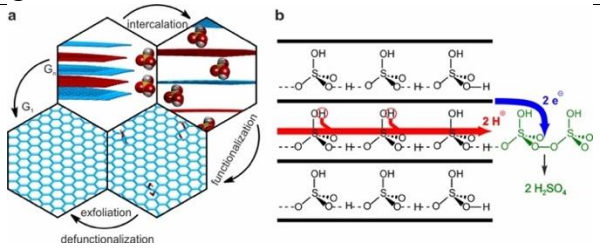

Figure 1: Mechanism for the formation of graphite sulfate

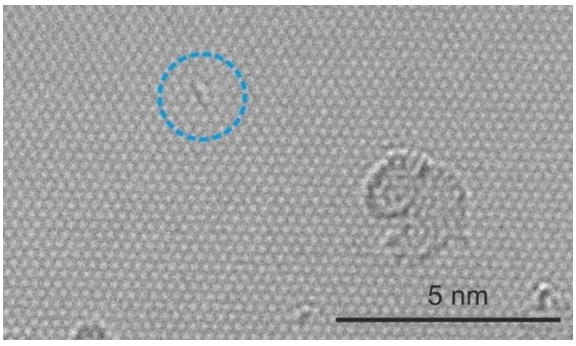

Figure 2: Transmission electron micrograph at atomic resolution of wet-chemically prepared graphene.