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Stellingen

Behorende bij het proefschrift

Chemical functionalization of the graphene surface for electrical and electrochemical sensing applications

1. The electrical sensing potential of the graphene surface – that lies on the extraordinary transport properties of the perfect sp^2 hybridized honeycomb lattice – can only be activated by breaking down the symmetry and sacrificing partially the carrier mobilities (Chapter 1 of this thesis).
2. The optimal electrochemical activity of graphene have been reached by increasing the density of states (DOS) and decreasing the conductivity through creating vacancy defects to a moderate density level (J. H. Zhong et al. *J. Am. Chem. Soc.* 2014, 136, 16609).
3. Graphene is 2D but not limited to 2D. Due to its two-dimensionality, graphene involves two interfaces: the one facing to the atmosphere, and the other one facing to its almost indispensable support, which can both impact in-plane transport of charge carriers (Chapter 2 of this thesis).
4. Prior to turning graphene to hydrogenated graphene, hydrogen radicals first chemically react with the hydrocarbon contaminants on the graphene surface (Chapter 2 and Chapter 4 of the thesis).
5. Unintentional oxidation of graphene can be a key player in determining the electrocatalytic properties of nitrogen doped graphene (Chapter 3 of this thesis).
6. Airborne hydrocarbons compete with water molecules to adsorb on the surface of graphene (Chapter 4 of this thesis).
7. Graphene is not really a 2D material, at least in millimeter-sized graphene sheets: the out-of-plane undulations scale with the size of graphene (Chapter 5 of this thesis).
8. The interaction between water and graphene is intriguing. When graphene floats on the surface of water, the flexible, smooth and pure water substrate minimizes any strain or doping in graphene. Water molecules on the surface of graphene cause p-doping together with oxygen and prevent hydrocarbons adsorption at the graphene surface (Chapter 4 and Chapter 5 of this thesis).
9. The best motivation to do PhD study is to keep your curiosity alive.
10. You will never realize how little you know until you know more.