

Einladung zum GDCh-Colloquium des Ortsverbandes Hannover

Das Colloquium findet um **16 s.t. im Lichthof Welfenschloß** (Ebene 01, Gebäude 1101) der Leibniz Universität Hannover, Welfengarten 1, D-30167 Hannover statt.

25.04.2024 Prof. Dr. Bernd Smarsly
Justus-Liebig-Universität Gießen

Non-graphitic carbon materials: dark matter with bright future?

Non-Graphitic Carbon (NGC) is the most abundant type of sp^2 -hybridized carbon materials and a class of material used on a million ton-scale. This type of carbon materials occurs in nature in the form of char coal and is, in industrially synthesized forms, applied as activated carbon, soot, and also in modern battery concepts. In spite of this diverse spectrum of applications, all NGC materials are composed of small graphene layer stacks possessing significant structural disorder in the single graphene sheets as well as the stacking. In particular, "hard carbon" which is used in sodium-ion battery (SIB) concepts belongs to this class of carbons, too. In spite of the significant industrial relevance of NGC materials, still the interdependence of macroscopic properties (conductivity, ...) and the disordered graphene-stack-structure are a matter of discussion. Hence, quantitative methodologies are needed for an accurate quantitative structural characterization of the graphene-stacks.

In my talk I will first resume the relevance of the materials and then present our works on characterizing these materials by wide angle x-ray scattering (WAXS/"XRD") and also wide- angle neutron scattering (WANS). [1] Interestingly, as a major insight, we found a surprisingly high degree of order within the small polyaromatic rings constituting the graphene structure, i.e. ordered aromatic core(s) surrounded by a less ordered shell. Such high degree of order for "disordered" NGC is unexpected and reshapes the general view on the structural make-up of NGCs.

Furthermore, the talk will discuss our recent work on ordered mesoporous "hard carbon" for sodium-ion battery concepts, applying suitable templating strategies to tune the mesopores. [2] Our study confirmed the relevance of closed nanoporosity for a stable cycling and furthermore may stimulate future work on the relationship between the graphene structure and the sodiation mechanism.

- 1) *X-ray Scattering of Non-Graphitic Carbon: An Improved Method of Evaluation*, Ruland, W.; Smarsly, B. J. *Appl. Cryst.* **2002**, 35, 624-633
- 2) *Lignin-derived Mesoporous Carbon for Sodium-Ion Batteries: Block Copolymer Soft Templating and Carbon Microstructure Analysis*, Glatthaar, C.; Wang, M. N.; Wagner, L. Q.; Breckwoldt, F.; Guo, Z. Y.; Zheng, K. T.; Kriechbaum, M.; Amenitsch, H.; Titirici, M.; Smarsly, B. M. *Chem. Mater.*, **2023**, 35, 24, 10416–10433 .

Prof. Dr. Jens-Uwe Grabow
Vorsitz OV Hannover

Vor dem Colloquium findet ab ca. 13:30h das Leibniz Universität Chemie Symposium (LUCS) statt.