GESELLSCHAFT DEUTSCHER CHEMIKER e.V.

Ortsverband Südwürttemberg

V O R T R A G

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Nanomaterial inks from insoluble rocks

Liquid exfoliation has become an important production technique to give access to large quantities of two-dimensional nanosheets in colloidal dispersion. Importantly, this is a highly versatile technique that can be applied to numerous layered materials beyond graphene. While this was clear over a decade ago, some major obstacles on the fundamental level of exfoliation, size selection and characterisation had to be overcome. In this talk, I will review the most important steps that allowed us to arrive at a point, where it is possible to produce samples suitable for (device) applications. This will include the following aspects:

- Elaborating reliable deposition and analysis protocols to quantify lateral size and layer number by AFM
- Size selection through centrifugation using band sedimentation and liquid cascade centrifugation including a novel quantitative description with an equation of motion accounting for dimensionality
- Crucial insights in the exfoliation mechanism that is based on simultaneous nanosheet delamination and tearing with an equipartition of energy
- The realisation that size and thickness information is encoded in optical absorption and extinction spectra that allows to derive metrics for nanosheet size through a correlation with microscopy statistics
- Exfoliation under inert gas which enables the analysis of degradation kinetics and thermodynamics (i.e. activation energy) revealing that many types of nanosheets are less stable in ambient conditions than expected
- Controlled deposition into tiled networks of well-aligned nanosheets with dense coverage

Strategies for achieving basal plane and edge functionalisation of transition metal dichalcogenide nanosheets in the liquid phase.

Donnerstag, **15. Mai 2025, 17.15 pm**
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gez. Ivana Fleischer