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# IMN-KOLLOQUIUM

## Dienstag, 5. Dezember 2023 um 11:00 Uhr im Feynmanbau Raum 115

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## Engineered Layered 2D Semiconductors and Energy Harvesting

Engineering Two-Dimensional (2D) Transition Metal Dichalcogenides (TMD) are receiving much attention from the scientific community as novel candidates for energy and environmental applications due to the possibilities of tuning their optical, mechanical, optoelectronic, and electrochemical properties by combinatorial stacking/vertical-lateral heterostructures (HSs) composed of quaternary and ternary alloys via controlled alloying and post-processing of different atomic layers.1-3 Visible light absorption, indirect to direct bandgap transition, layer-dependent tuneable photoluminescence (PL) etc. are some of the main properties of layered TMDs, making them unique for optoelectronics and photocatalysis applications. The current research aims at preparing novel TMD alloys with combinations of different transition metals (M: Mo, W, V) and chalcogenides (X: S, Se and Te) by chemical vapour deposition (CVD) (e.g. quaternary (Mo1-yWyS2(1-x)Se2x) and ternary (MoS2(1-x)Se2x or Mo1-yWyS2(1-x)) to develop efficient photodetectors, photo- and electro-catalysts (PCs and ECs). Actually, 2D TMDs with different compositions and structural phases provide a playground where, engineering their band structure, new avenues to construct novel PCs and ECs can be paved. A simple atmospheric pressure CVD deposition technique will be used to deposit pristine and combinatorial- quaternary & ternary alloyed atomic layers of TMD onto various substrates. Their photophysical and photocatalytic properties will be measured by visible light absorption and Raman/PL spectroscopies. Their structure property at an atomic level is investigated by high-angle annular dark field (HAADF) - scanning transmission electron microscopy (STEM) and Auger electron spectroscopy (AES) techniques to probe chemical and compositional surface environments in quaternary/ternary TMD alloys including vdW HSs. The microstructure and photoconductive and photo(electro)catalysis properties of engineered 2D layered semiconductors will be elucidated in detail in this talk.

Vortragssprache: deutsch / Folien: englisch