TECHNISCHE UNIVERSITÄT DRESDEN

Collaborative Research Centre 1415 „Chemistry of Synthetic Two-Dimensional Materials"

Seminar

DATE: 19 October 2023
TIME: 3:00 PM
LOC: IFW/Lecture Hall

GUEST SPEAKER:

Prof. Anjana Devi
Ruhr-University Bochum
Inorganic Materials Chemistry

TITLE:
"New precursor chemistries pave the way to unearth 2D type materials"

ABSTRACT:

Two-dimensional (2D) materials possess exceptional properties rendering them attractive nanomaterials in next-generation electronics, optical, energy and sensor related applications. To realize the technological potential of 2D materials such as transition metal dichalcogenides (TMDCs), highly controllable and scalable routes are required. Although a variety of synthesis materials have been developed for TMDCs, it is still challenging to produce large-scale high-quality crystalline layers. Compared to the top-down methods, the bottom-up approach of synthesizing 2D materials has a wider application scope. Chemical vapor deposition (CVD) and atomic layer deposition (ALD) routes show great promise, because they enable large area synthesis, yield excellent uniformity, unrivalled conformality and atomic-scale controllability apart from being industry compatible. For CVD and ALD of TMDCs, precursors play a pivotal role on the nature of the layers formed. In this presentation, the interplay between metalorganic precursors, deposition conditions and material properties of representative TMDCs (MoS_2 and WS_2) will be highlighted. Measures to circumvent the high temperatures associated with the classical CVD processes will be discussed. The studies on nucleation and growth of the layers on different substrates revealed different growth modes and nucleation density. The new precursor combinations pave the way for the direct growth of large area crystalline growth of TMDCs at moderate to low temperatures, which is a significant advantage for a wide range of applications.

PROFILE OF Prof. Anjana Devi

Anjana Devi obtained her PhD in Materials Research from the Indian Institute of Science (IISc), Bangalore, India in 1998. She moved to Germany in 1998, for postdoctoral research with the fellowship granted by the Alexander von Humboldt (AvH) foundation. At the Ruhr University Bochum (RUB), her research was on group III-V nitrides employing new approaches for epitaxial film growth via metalorganic chemical vapor deposition (MOCVD). Subsequently she focused on developing new metalorganic precursors for atomic layer deposition (ALD) of functional metal oxides within the scope of a Habilitation project funded by the Alfried Krupp von Bohlen and Halbach Foundation.

In 2002 Anjana Devi was appointed as a junior professor and in 2011 she was tenured as a professor for Inorganic Materials Chemistry (IMC) at RUB. Her research concentrates on developing novel precursor chemistries and employing them for CVD and ALD of nanostructured functional materials. During the last 15 years, she has been instrumental in setting up national and international ALD networks. Coordinating and participating in joint research consortiums namely EU-COST-HERALD, EU-COST-OPERA, EU-COST-CELINA, in EU-ITN projects (ENHANCE, RAPID, HYCOAT), ForLab-Bochum, organizing national and international conferences are some of the main highlights. Her successful research collaboration with the leading ALD international groups worldwide has led to an excellent platform to contribute further to the emerging fields of ALD, areas selective deposition (ASD) and atomic layer etching (ALE) of functional materials. She closely works with leading industry partners which has have given new input and impetus in terms of focusing on ALD and CVD based technological applications for streamlining her research activities.

In 2020 she was awarded the honorary doctorate for science and technology by the Aalto University in Finland in recognition of her contributions to the field of precursor chemistry for ALD applications. Since 2022, she is also leading an Attract research group at the Fraunhofer Institute for Microelectronics Circuits and Systems (IMS), where she concentrates on large scale fabrication of 2D materials and applying the materials for microelectronics, sensors, and energy related technologies.