INDIAN ASSOCIATION FOR THE CULTIVATION OF SCIENCE

2A & 2B, Raja S.C. Mullick Road, Jadavpur, Kolkata-700032, India

Seminar Notice

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School of Physical Sciences

Title:	**Electronic structure of novel two-dimensional materials**
Speaker:	**Sanjoy K. Mahatha,Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany**
Date:	**July 9, 2019 (Tuesday)**
Time:	**3:00 p.m.**
Venue:	**Physics Seminar Room (C-406), 3rd Floor, Centenary Building, IACS**
Abstract:	Two-dimensional (2D) materials, such as graphene or single-layer (SL) transition metal dichalcogenides (TMDCs), have electronic properties that are drastically different from those of their parent compounds. TMDCs offer a wide range of electronic properties with metallic, semiconducting and insulating behaviours along with complex correlated charge-density wave (CDW) and Mott insulating states. Moreover, these properties do not only depend on the 2D materials itself but also on their environment, for example on the substrate they are placed on. In this talk, first, I will show how the lack of inversion symmetry in SL-MoS2 and WS2 grown on Au(111) results in a unique situation where the electron-phonon coupling strengths differ significantly for the spin-split states in the K valleys [1, 2]. In the second part of this talk, I will show how the well-known hybridization effect between SL-WS2 and Ag(111) substrate [3] can be lifted via intercalation to yield an electronic band structure that is reminiscent of free-standing SL-WS2 [4]. Finally, I will focus on the electronic structure of temperature-dependent CDW phases of bulk 1T-TaS2 [5, 6], particularly on the commensurate CDW phase that has widely been studied as a quasi-2D phenomenon, coexisting with a Mott insulating state. However, recent theoretical calculations predict the coexistence of the CDW phase with a nearly 1D metallic dispersion perpendicular to the crystal planes [7]. Our photoemission results confirm the existence of this dispersive band [8] and challenge the hitherto existing, simplified notion of viewing this TMDC CDW material as quasi-2D. References: [1] S. K. Mahatha et al., Surf. Sci. 681, 64 (2019). [2] N. F. Hinsche et al., Phys. Rev. B 96, 121402(R) (2017). [3] M. Dendzik et al., Phys. Rev. B 96, 235440 (2017). [4] S. K. Mahatha et al., Phys. Rev. Materials 2, 124001 (2018). [5] K. Rossnagel, J. Phys.: Condens. Matter 23, 213001 (2011). [6] S. K. Mahatha et al., Manuscript under preparation. [7] P. Darancet, et al., Phys. Rev. B 90, 045134 (2014). [8] A. S. Ngankeu, S. K. Mahatha, et al., Phys. Rev. B 96, 195147 (2017).

All are cordially invited to attend the seminar