



**S N BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

Block JD, Sector III, Salt Lake, Kolkata 700 106

DEPARTMENTAL SEMINAR
Condensed Matter Physics and Material Sciences

27th October'2021

4.00PM

ONLINE

SPEAKER

**Dr. Aftab Alam, Associate Professor
Department of Physics, IIT Bombay,**

TITLE OF THE TALK

Broken symmetry driven topological phase transitions in SrAgAs

ABSTRACT

We show the occurrence of Dirac, Triple point, Weyl semimetal and topological insulating phase in a single ternary compound using specific symmetry preserving perturbations. Based on first principle calculations, k.p model and symmetry analysis, we show that alloy-induced symmetry breaking in SrAgAs (space group P63mc) helps to tune various low energy phases transforming it from Dirac to topological insulating state via intermediate triple point phase. We also consider the effect of external magnetic field, causing time reversal symmetry (TRS) breaking, and analyze the effect of TRS towards the realization of Weyl state. Topological insulating nature is further confirmed by calculating Z₂ index. Topologically protected surface states and Fermi arcs are also investigated in some detail. Most importantly, in this material, the Fermi level lies close to the nodal point with no extra Fermi pockets. This, in turn, makes these compounds an ideal platform to realize distinct topological phases and hence pave a path for experimentalists to verify the theoretical findings with appropriate probe. Such discovery of new candidate materials using alloy engineering is extremely useful to guide further design of topological quantum materials.

References:

- [1] Wu et al., Phys. Rev. B 98, 081115(R) (2018).
- [2] Alam et al., Phys. Rev. B 99, 205112 (2019)
- [3] Alam et al., Phys. Rev. Mater. 4, 084201 (2020)

HOST FACULTY

Dr. Thirupathaiiah Setti

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