



Contribution ID: 348

Type: Oral Presentation

Optical spectroscopic investigations of antiferromagnetic semiconducting BaMn_2P_2

Friday 11 July 2025 10:50 (20 minutes)

Materials with ThCr_2Si_2 -type crystal structure (Space Group: $I4/mmm$) have sparked scientific interest for several decades now owing to their novel properties and exotic ground states. The ThCr_2Si_2 -type compounds have physical properties that are highly tunable, making this family of compounds ideal for investigating the structure-property relationship. Unconventional high T_c superconductivity was observed in iron-based arsenides, BaFe_2As_2 [1] and $\text{BaFe}_2\text{CoAs}_2$ [2]. The quest for higher T_c superconductivity led research into other BaT_2Pn_2 compounds, where T = transition metal and Pn = P, As, Sb, Bi, revealing a variety of physical properties. BaMn_2P_2 is one such compound that was recently investigated by us [3]. Electrical resistivity and heat capacity measurements on single crystals of BaMn_2P_2 revealed an insulating ground state with a small band gap [3]. Anisotropic magnetic susceptibility measurements confirmed that BaMn_2P_2 , like its As-, Sb- and Bi- counterparts, has collinear Néel type antiferromagnetism below T_N = 795(15) K, which is the highest value for the family of 122-pnictide compounds thus far. Moreover, the magnetic susceptibility increases above T_N , like in the As-, Sb-, and Bi-based compounds, suggesting that antiferromagnetic correlations persist above the magnetic ordering temperature. In this contribution, we probe the properties of this interesting compound using Raman spectroscopy, investigating its structure around T_N . We also attempt to probe the effect of tweaking the ground states by changing charge-carrier concentrations.

References

1. M. Rotter, M. Pangerl, M. Tegel, D. Johrendt, Angew. Chem. Int. Ed. **47** (2008).
2. A. S. Sefat, R. Y. Jin, M. A. McGuire, B. C. Sales, D. J. Singh, D. Mandrus, Phys. Rev. Lett. **101** (2008).
3. B. S. Jacobs and Abhishek Pandey, Phys. Rev. Mater. **7** (2023).

Apply for student award at which level:

None

Consent on use of personal information: Abstract Submission

Yes, I ACCEPT

Primary authors: JACOBS, Susan (University of Johannesburg); ERASMUS, Rudolph (University of the Witwatersrand, Johannesburg); PANDEY, Abhishek (School of Physics, University of the Witwatersrand)

Presenter: JACOBS, Susan (University of Johannesburg)

Session Classification: Physics of Condensed Matter and Materials

Track Classification: Track A - Physics of Condensed Matter and Materials