Joint Condensed Matter and Center Soft Matter and Biological Physics Seminar

Prof. Sunxiang Huang

(University of Miami)

"The Multifaceted Physics of Correlated Topological Kagome Metals in Thin Films"

Date/Time: *Monday, October 11, 2021*

4:00pm -5:00pm

Virtual Meeting

Zoom Link: https://virginiatech.zoom.us/j/81109264826

Abstract: Recently, a class of materials known as topological Kagome metals (TKMs) are rapidly being recognized as exciting topological materials with rich magnetic ordering and electron correlations. At the heart of TKMs are layered 2D Kagome lattices occupied by transition metals (Fe, Mn, Co), which give rise to exotic topological band structure with a coexistence of Weyl/Dirac cones and flat bands. The research on TKMs has mostly centered on bulk compounds. The introduction of high-quality epitaxial films and heterostructures enables opportunities to achieve properties and functions impossible within parent materials.

In this talk, I will describe our realization of high-quality epitaxial thin films of several TKMs (Mn_3Sn, Fe_3Sn_2, FeSn, and CoSn). I'll then discuss their multifaceted physics in thin films, including Kondo physics in $Mn_{3+x}Sn_{1-x}$ [1], spintronic properties of TKMs [2,3], and superconducting proximity effect with potential triplet pairing in the heterostructure between TKMs and the superconductor Nb.

[1] D. Khadka, T. R. Thapaliya, S. H. Parra, X. Han, J. Wen, R. F. Need, P. Khanal, W. Wang, J. Zang, J. M. Kikkawa, L. Wu, and S. X. Huang. Kondo physics in antiferromagnetic Weyl semimetal $Mn_{3+x}Sn_{1-x}$ films. *Science Advances* **6**, eabc1977 (2020).

[2] D. Khadka, T. R. Thapaliya, S. H. Parra, J. Wen, R. Need, J. M. Kikkawa, and S. X. Huang. Anomalous Hall and Nernst effects in epitaxial films of topological kagome magnet Fe_3Sn_2. *Physical Review Materials* **4**, 084203 (2020).

[3] D. Khadka, T. R. Thapaliya, J. Wen, R. F. Need, and S. X. Huang. High quality epitaxial thin films and exchange bias of antiferromagnetic Dirac semimetal FeSn. *Applied Physics Letters* **117**, 032403 (2020).

Sunxiang Huang got his PhD in Physics at the Johns Hopkins University in 2011. He joined the department of physics as an assistant professor at the University of Miami in 2014. His research interests lie in novel quantum/spintronic materials which bridge emerging fundamental physics and technological applications. His recent research focuses on the epitaxial then films and heterostructures of topological Kagome metals and the studies of their topological/spintronic/ superconducting properties.

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