Charge density wave in Kagome lattice FeGe

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A hallmark of strongly correlated quantum materials is the rich phase diagram resulting from competing and intertwined phases with nearly degenerate ground state energies. A well-known example is the copper oxides, where a charge density wave (CDW) is ordered well above and strongly coupled to the magnetic order to form spin-charge separated stripes that compete with superconductivity. Recently, such rich phase diagrams have also been revealed in correlated topological materials. In two-dimensional kagome lattice metals consisting of corner-sharing triangles, the geometry of the lattice can produce flat bands with localized electrons, non-trivial topology, chiral magnetic order, superconductivity and CDW order. While CDW has been found in weakly electron correlated nonmagnetic *A*V3Sb5 (*A* = K, Rb, Cs), it has not yet been observed in correlated magnetic ordered kagome lattice metals. Here we report the discovery of CDW within the antiferromagnetic (AFM) ordered phase of kagome lattice FeGe. The CDW in FeGe occurs at wavevectors identical to that of *A*V3Sb5, enhances the AFM ordered moment, and induces an emergent anomalous Hall effect. Our findings suggest that CDW in FeGe arises from the combination of electron correlations-driven AFM order and van Hove singularities-driven instability possibly associated with a chiral flux phase, in stark contrast to strongly correlated copper oxides and nickelates, where the CDW precedes or accompanies the magnetic order.

Brief BIO of Pengcheng Dai

Pengcheng Dai obtained his B.S. in 1984 from Zhengzhou University and his Ph. D in 1993 from University of Missouri. He did 3 years postdoc at Oak Ridge National Laboratory up graduation, and became a staff member at Oak Ridge National Laboratory from 1996 till 2001. In 2001, he moved to The University of Tennessee as an associated professor, became full professor in 2006. In 2008, he was promoted to Tennessee Advanced Materials Laboratory chair professor. In 2013, he moved from The University of Tennessee to Rice University, and is currently Sam and Helen Worden professor of physics at Rice. His group has focused on using neutron scattering as a probe to study correlated electron materials over the past two decade. He is a APS, AAAS, and NSSA fellow, and won sustained prize of neutron scattering society of America in 2016 and The Heike Kamerlingh Onnes Prize in 2022. He is currently a divisional associate editor of PRL. He published over 300 papers with google citation of > 22600.