Intertwined Charge Density Wave Order and Superconductivity in New Classes of Kagome Metals

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Compounds built from two-dimensional kagome networks of metal ions have long been of interest due to their potential for realizing a broad array of anomalous electronic states, ranging from quantum spin liquid phases to unconventional superconductivity. More recently, kagome metals have come into focus as compelling platforms featuring an interplay between topologically nontrivial electronic states and correlated electron phenomena. This interplay can naively be realized via the coexistence of an interference-driven flat band, Dirac points, as well as multiple van Hove singularities formed from the band structure of the kagome network. An enduring challenge is to identify these states in real materials, and, in this talk, I will present recent work exploring the AV3Sb5 (A=K, Rb, Cs) class of kagome metals. These compounds are Z2 metals with a band filling close to the kagome network’s van Hove singularities, and this gives rise to charge density wave order as well as a lower temperature superconducting ground state. The unconventional properties of the charge density wave state, how it seemingly intertwines with superconducting order, as well as open questions and future directions will be discussed. If time permits, recent work searching for similar states in related kagome metals will be presented.