# Saddle point in kagome metals

**Hengxin Tan**

*Weizmann Institute of Science, Rehovot, Israel*
*E-mail: hengxin.tan@weizmann.ac.il*

The saddle point, also known as the van Hove singularity, represents a critical point in the electronic structure. It is a fundamental feature of the kagome lattice and is believed to be responsible for many intriguing phenomena. In this talk, I will first introduce the unique role the saddle point plays in the charge density wave (CDW) formation of kagome superconductors $AV_3Sb_5$ ($A$=K, Rb, Cs) and the topological semimetal $ScV_6Sn_6$. The power of the saddle point in triggering electronic instabilities lies in its divergent density of states (DOS) in two-dimensional (2D) space. In contrast, an ordinary saddle point in three-dimensional (3D) space does not exhibit a pronounced DOS peak, resulting in less common instabilities in 3D materials. I will demonstrate that the DOS of the 3D saddle point can be significantly enhanced through the higher-order saddle point (HOSP), characterized by a higher-order momentum-dependent energy dispersion. The flattened band structure of the 3D HOSP presents more opportunities for fascinating electronic instabilities and correlation effects in 3D materials. Potential material candidates for 3D HOSP will be discussed, along with the relationship between the 3D saddle point and CDW formation in $ScV_6Sn_6$.

## References

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