Search for flat bands in a kagomé metal

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The kagomé (woven bamboo mat) lattice, a triangular network with one quarter of its nodes removed, is a particularly simple venue for seeing classical and quantum effects of frustration. Theoretical approaches have yielded many interesting conjectures (including for example the possibilities of quantum spin liquids and a fractional quantum Hall effect at zero applied field for ferromagnets), but experiments on real materials containing kagomé layers have not validated even relatively straightforward predictions, such as flat bands, especially for metals. This follows because of the three-dimensionality and large unit cells of the materials, the presence of defects ranging from vacancies to crystallographic twins, and the surface sensitivity of key experimental probes such as angle-resolved photoemission. We describe recent progress exploiting both density functional theory and various spectroscopic tools towards actually identifying flat bands in one kagomé system, Fe3Sn2, and describe their properties and effects on the other excitation bands that are inevitably present in real materials.

References

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