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Accessing bands with extended quantum metric in kagome $Cs_2Ni_3S_4$ through soft chemical processing

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Flat bands have been associated with excoct effects in materials, such as strong correlations, superconductivity, or the fractional quantum Hall effect

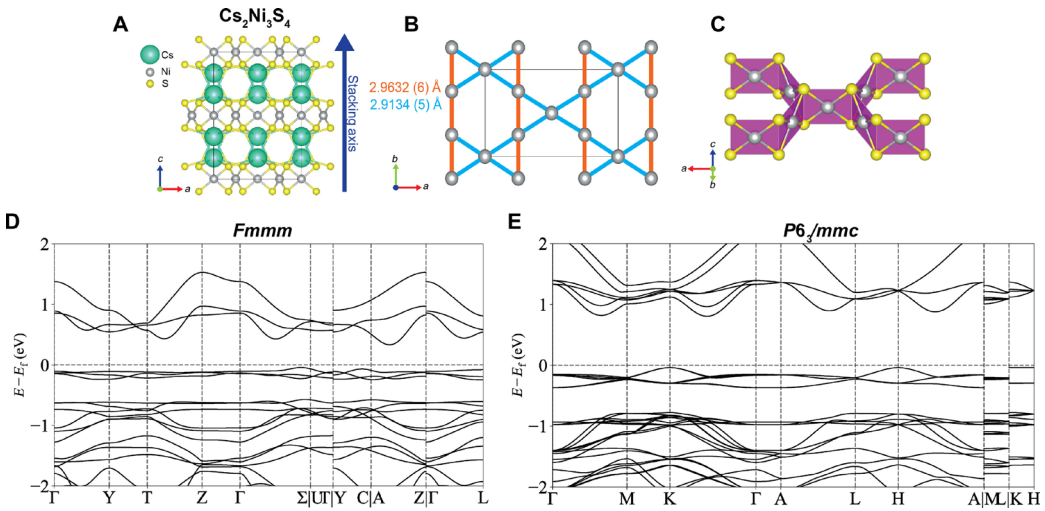
In bulk materials they are difficult to be isolated form other electronic states. In addition, they are often at non-accessible energies.

In this work, Schoop and Bernevig collaborated to access flat bands in a new material using soft-chemical modification of a known materials

The intimate collaboration between theory (Bernevig) and experimental chemistry (Schoop), which is facilitated by MRSEC was instrumental for this achievement.

Bernevig's theory showed that the flat bands in questions are promising to host the desired physical effects. Schoop developed a new chemical methods that enabled to energetically access those bands.

The new material shows promise for correlations.



Structure models for $Cs_2Ni_3S_4$ from experimental powder x-ray diffraction refinements and calculated band structure.
The stacking direction of the nickel layers sandwiched between double layers of cesium can be seen in (**A**) along with the stacking direction along the *c* axis. The slightly distorted kagome lattice is depicted in (**B**) with color-coded bond lengths. The square-planar Ni-S coordination environment is shown in (**C**). The *Fmmm* (**D**) and $P6_3/mmc$ (**E**) band structure show the flat bands close to the Fermi level.

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