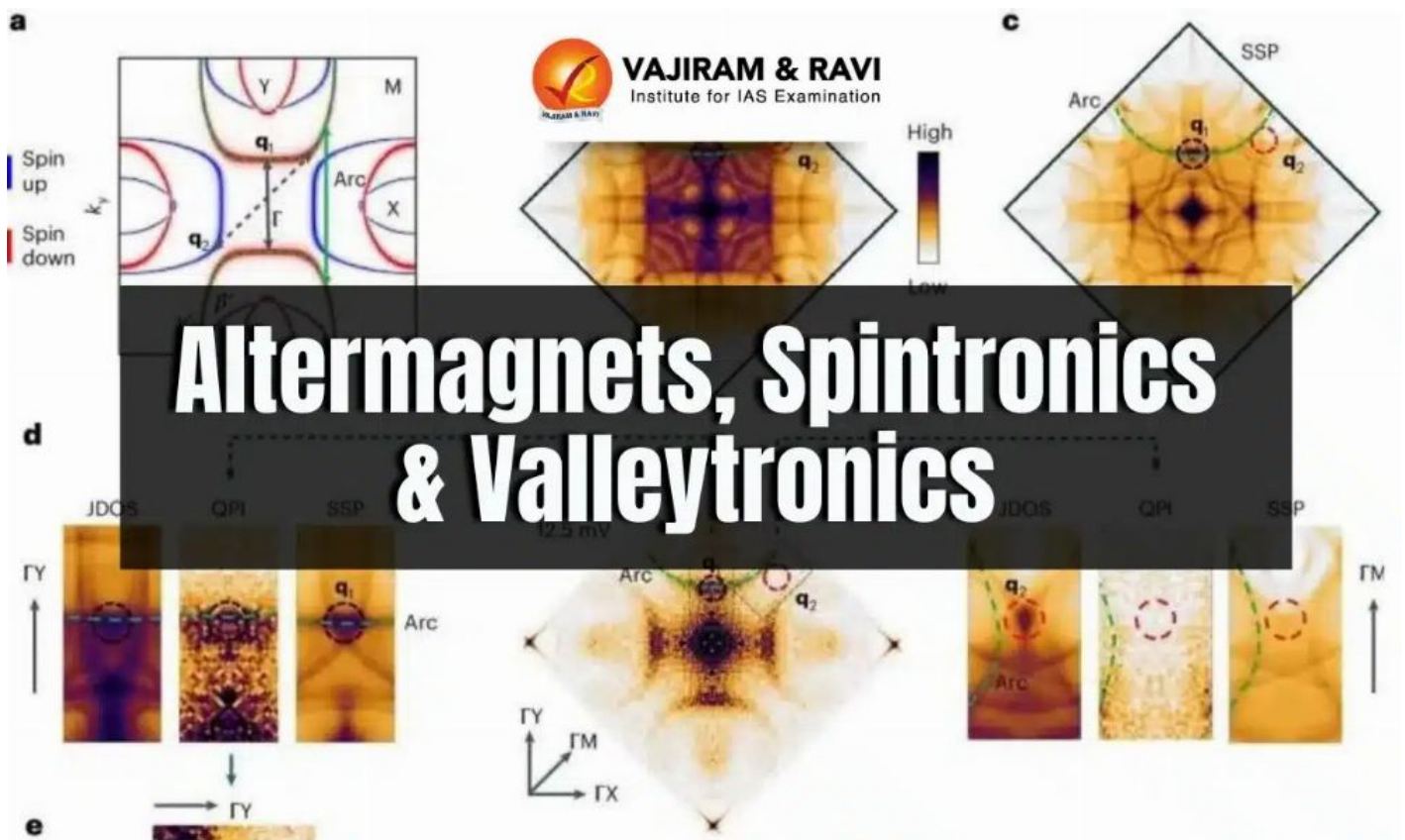


Altermagnets, Spintronics & Valleytronics

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Altermagnets, Spintronics & Valleytronics Latest News

A research team led by the Hong Kong University of Science and Technology (HKUST) has reported the first-ever experimental observation of a two-dimensional layered room-temperature altermagnet.

About Altermagnets

- **Altermagnets** are a new class of antiferromagnetic materials that **exhibit momentum-dependent spin splitting without requiring spin-orbit coupling (SOC) or net magnetization**.
- This novel spin splitting mechanism arises due to **exchange interactions between crystal-symmetry-connected magnetic sublattices**, creating a phenomenon known as **C-paired spin-valley locking (SVL)**.
- **Altermagnetism** combines the **long spin lifetimes and magnetic stability** of antiferromagnets with the **advantage of spin-split energy bands**, making them ideal for **spintronic applications**.

About Spintronics

- **Spintronics** (short for **spin transport electronics**) is a field of electronics that utilises both the **intrinsic spin and charge of electrons** to store, process, and transfer data.
- It offers **faster processing speeds, higher integration densities**, and **reduced energy consumption**.
- Key **spintronic devices** include **spin transistors, spin diodes, spin filters, spin RAM**, and **spin logic gates**.
- In contrast to conventional electronics, which rely solely on electron **charge**, spintronics provides an additional degree of freedom—**electron spin**, enabling **energy-efficient computation**.
- **Valleytronics** is an emerging field that uses **valley degrees of freedom** (minima in energy bands) to store and manipulate data. Like spin, **valley indices** can be used as binary information units, potentially offering **faster and denser data processing**.

Source: PHY

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