



Semi - Dirac Metals

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Why in News

Researchers from the Indian Institute of Technology - Bombay have discovered special properties in a class of materials called “semi-dirac metals”.

How Semi - Dirac Metals differ from other metals?

- **Dirac metals** differ from normal metals in that the **energy depends linearly on the momentum**. This difference is also responsible for their unique properties.
- **Semi-Dirac metals behave like Dirac metals in one direction and like normal metals in the perpendicular directions** (since their microscopic structure is different along the two directions).
- **Examples** of semi-dirac metals are systems such as TiO₂/V₂O₃ nanostructures.

Properties Discovered

- The direction-dependence of microscopic properties gives Semi - Dirac material **special optical properties**.
 - Semi-Dirac materials have very high optical conductivity of electromagnetic waves (light waves). These waves are of a specific frequency and a specific polarisation.
 - **Optical conductivity** is a measure of the opacity offered by the material to the passage of light through it.
 - Semi - Dirac materials would be transparent to light of a given frequency and polarisation when it is incident along a particular direction.
 - These materials would be opaque to the same light when it falls on it from a different direction.
 - There are many known applications for transparent conducting films – the common example being touch screens used in mobiles.

- The material possesses interesting **thermoelectric properties**.
 - Thermoelectricity is a **clean energy technology** that uses waste heat to produce electricity typically in low power applications.
 - This technology is used in efficient cars, where it is used to keep the lights on and to warm seats.

Source: TH