Dirac Metals

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Why in news?

Researchers from IIT Bombay have discovered special properties in a class of materials called “semi-Dirac metals”.

What are Dirac Metals?

- Metals are good conductors of electricity in which energy depends on the momentum of electrons.
- Dirac metals differ from normal metals in that the energy depends linearly on the momentum of electrons.
- Semi-Dirac metals behave in one direction like Dirac metals and in perpendicular directions like regular metals (since their microscopic configuration is different in both directions). Examples of semi-Dirac metals are systems such as TiO2/V2O3 nanostructures (Titanium and Vanadium oxides).
- Such materials would be transparent to light of a given frequency and polarisation when it is incident along a particular direction.
- The same material would be opaque to the same light when it falls on it from a different direction.
- The research shows very high optical conductivity of semi-Dirac materials of a specific frequency and specific polarization for electromagnetic waves[light waves].

Applications

- Used for transparent film-making like the mobile touch screens.
- The material possesses interesting thermo-electric properties.
- Thermoelectricity is a clean energy system that utilizes waste heat to generate electricity usually for

applications with low power.

- This technology is used in efficient cars, for keeping the lights on and to warm seats.