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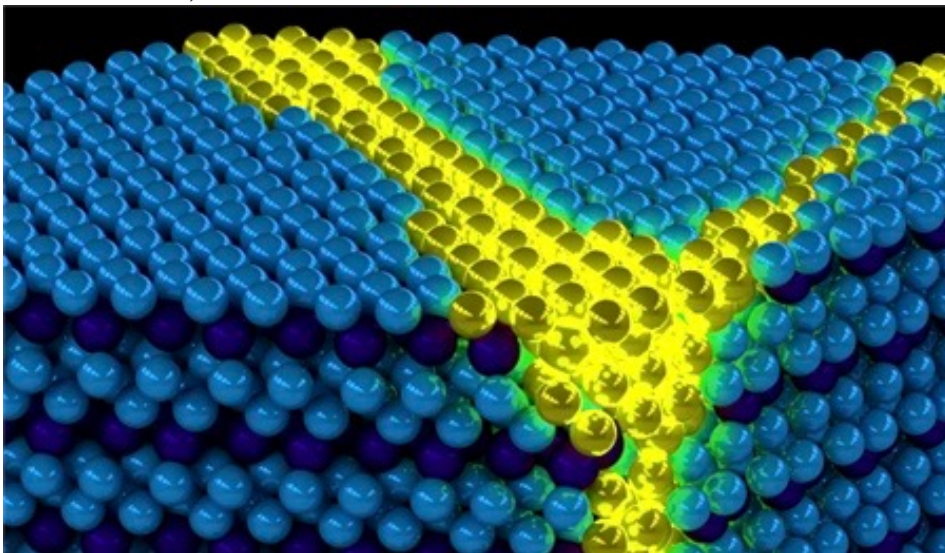
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Researchers Discover Excitonium - a Weird New Form of Matter

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Scientists Confirm Discovery Of A New Form Of Matter

The exact properties of excitonium remain to be studied, but theoretical physicists debate whether the matter is a superconductor, an insulator, a superfluid - or maybe all three - providing convincing arguments for every version.

"This result is of cosmic significance", Abbamonte [stated in a press release](#). It is created up of [excitons](#), particles that are made in a weird quantum mechanical pairing precisely that of an emerged electron and the

hole it left back.

Researchers from the University of California and University of IL claim to have observed and measured excitonium - a form of matter that displays quantum properties.

Experts from the University of California Berkeley and the University of IL at Urbana-Champaign in the U.S. examined non-doped **crystals** of the changing metal dichalcogenide titanium diselenide. Though it's completely unrelated to **exciton** formation, *Peierls phases* and **exciton** condensation share the same symmetry and similar observables—a superlattice and the opening of a single-particle energy gap. When the departed electron with its negative charge, matches up with the hole, the two exceptionally form a particle, a boson, an **exciton**.

But **Peter Abbamonte**, a professor at the University of IL with his team overcame this challenge and developed momentum-resolved electron energy-loss spectroscopy (M-EELS) by using a novel technique.

"Ever since the term "excitonium" was coined in the 1960s by Harvard theoretical physicist Bert Halperin, physicists have sought to demonstrate its existence", said **Peter Abbamonte**, professor at University of IL. M-EELS is more sensitive to excitations than other conventional techniques.

The technique measures an electron's momentum very precisely. With the help of it, researchers were able to make first ever observations of paired electrons and holes.

An artist's depiction of the collective **excitons** in an excitonic solid.

Many scientists have published evidence of excitonium existence, but they do not have definitive proof of their findings.

Kogar admits, discovering excitonium was not the original motivation for the research—the team had set out to test their new M-EELS method on a **crystal** that was readily available—grown at Illinois by former graduate student Young Il Joe, now of NIST. "So although we didn't immediately get at why it was occurring in TiSe₂, we did know that it was an important result—and one that had been brewing in our minds for a few years". They described how they detected excitonium [in the journal Science](#).

This fundamental research holds great promise for unlocking further quantum mechanical mysteries: after all, the study of macroscopic quantum phenomena is what has shaped our understanding of quantum mechanics. It could also emit radiation on the metal-insulator transition in band solids, in which **exciton** compression is considered to perform a part.

While the discovery gives us a more detailed understanding of another mystery of quantum mechanics, the practical applications of excitonium are now in a speculative stage.

Anshul Kogar et al.

Notícias recomendadas

[Hibs' Ambrose Scores Against Former Club Celtic In Fightback Draw](#)

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After a goalless first half, Celtic broke the deadlock thanks to Scott Sinclair on the hour mark. In the 76th minute, Ambrose pulled a goal back for Hibernian to sta