

Cholesterol could power tomorrow's electronics

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Cholesterol can be used to control the spin of electrons—an invisible quantum property that could contribute to the development of energy efficient next generation spintronic devices.

Cholesterol, the fat like substance which is typically related to heart diseases serves as an ideal platform for constructing supramolecular based spintronic materials.

This is because it enables precise control over molecular properties due to its intrinsic handedness (chirality) and flexibility.

Scientists from Institute of Nano Science and Technology (INST), Mohali, an autonomous institute of the Department of Science and Technology (DST) have introduced cholesterol-based nanomaterials as novel platforms for future quantum technologies and spintronic applications.

These materials could manipulate the spin of electrons-- a quantum feature critical for the next generation of electronics. By combining metal ions with the organic framework, the team of scientists led by Dr. Amit Kumar Mondal have shown that how well a material can separate electrons based on their magnetic "spin" orientation by adjusting the kind and concentration of metal ions.



Fig: Dr. Amit Kumar Mondal & his team

By combining cholesterol with different metal ions, the researchers created nanomaterials that selectively filter electron spins. Interestingly, both spin directions could be controlled within a single system. This means that with a simple chemical tweak or an achiral chemical stimulus the scientists could tune the flow of spin information. Their findings, recently got published in *Chemistry of Materials*.

This chemical tunability provides a powerful and elegant technique for manipulating spin information with high precision, representing a substantial advancement in the development of biomaterials for advanced quantum and spin technologies.

This could lead to Energy-efficient memory chips for greener technology and bioelectronic devices, since the spin-based materials can help separate molecules with extreme precision.

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