Study of tiny magnets may advance their use in microelectronics

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In the world of the very small, researchers at Shanxi University in China have announced progress in understanding the single-molecule magnet, which combines the classical macroscale properties of a magnet with the quantum properties of a nanoscale entity. In the Journal of Applied Physics, Hai-Bin Xue and colleagues studied the statistics of how electrons move through a single-molecule magnet to better understand the magnet's inner level structure.

Understanding the single-molecule magnet inner level structure is an important step toward the development of revolutionary ways to store and process information, as well as quantum computation. The results are important to the field of molecular spintronics, which combines molecular electronics with the field of spintronics -- the manipulation of spin and charge.

"The single-molecule magnet can be regarded as a magnetic quantum dot with a more complex level structure," says co-author Yi-Hang Nie, "which makes it a good candidate for molecular spintronics devices."

How electrons move through single-molecule magnets is not well understood. "The current-voltage characteristics of such a system are not known well enough for practical application," says co-author Hai Bin Xue. "Our results go significantly beyond earlier studies of magnetic molecules in general, for which the current noise has been studied very little. The predictions permit experimental tests in the near future."

More information: The article, "Tunable electron counting statistics in a single-molecule magnet," by Hai-Bin Xue, Y.-H. Nie, Z.-J. Li, and J.-Q. Liang appears in the Journal of Applied Physics.
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