Single-molecule magnets may find their use in microelectronics

In a project funded by NSFC, Xue Haibin and his colleagues at Shanxi University have made progress in understanding the single-molecule magnet, which combines the classical macroscale properties of a magnet with the quantum properties of a nanoscale entity. Their findings were reported in the *Journal of Applied Physics* in October 2010 for research on the statistics of how electrons move through a single-molecule magnet to better understand the magnet's inner level structure.

According to a report by EurekAlert, in the world of the very small, 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."

The title of the article published on the *Journal of Applied Physics* is "Tunable electron counting statistics in a single-molecule magnet," coauthored by Hai-Bin Xue, Y.-H. Nie, Z.-J. Li, and J.-Q. Liang