New rotors could help develop nanoscale generators

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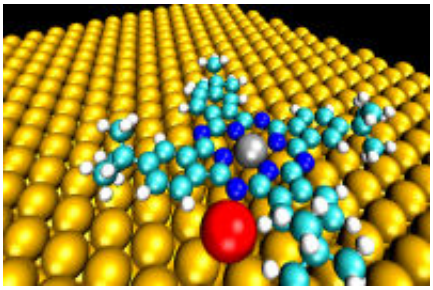

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(PhysOrg.com) -- Scientists at the University of Liverpool have developed a molecular structure that could help create current-generating machines at the nanoscale.

In collaboration with the Chinese Academy of Sciences in Beijing, scientists have investigated the rotation of molecules on a fixed surface to understand how they may help in the development of future rotor-based machinery at nanoscale level.

The research focused on rotating magnetic fields, which play an important part in machines like electric motors and generators. The difficulty for technology at the atomic scale is to replicate this property with rotors the size of small molecules. A number of rotating molecules

have already been identified, but so far molecules have not been used to create rotating magnetic fields.

The researchers used a gold metal surface to anchor phtalocyanine molecules, which have a metallic centre, in a large array. The anchor point, a single gold atom on top of the gold surface attached to a nitrogen atom of the molecule, allowed the molecules to rotate just off-centre.

Professor Werner Hofer, from the University's School of Chemistry, explains: "The difficulty in creating molecular rotors is that molecules need a fixed anchor point and will often react with the surface you want to fix them to. A gold surface interacts very weakly with molecules; it moreover provides regular anchor points to attach single molecules, which then line up in large and well ordered arrays."

"The centre atoms, which are metallic, spin around the gold atoms creating an off-axis rotation. The beauty of phtalocyanines is that the centre can be functionalised with any metal atom; the research could then lead to the development of rotating magnetic fields at a very small scale."

Scientists believe that this could be the first step towards the fabrication of machines for the generation of currents at small scale.

The research is published in Physical Review letters.

Source: University of Liverpool (news : web)