Nanoswitches converting light into macroscopic motion

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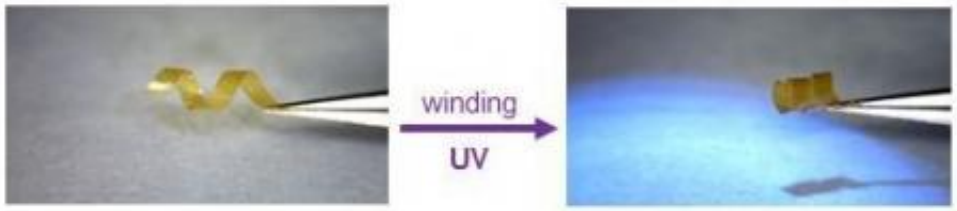

Researchers of the University of Twente's MESA+ research institute have developed spiral ribbons made of molecules, that are able to convert light into complex macroscopic motion. Therefore, they managed to amplify molecular motion and translate it to the macroscopic world. The research, which was inspired by movement in plants, is published in the major scientific journal *Nature Chemistry*.

Over the past decades, chemists have constructed various molecular machines, including molecular tweezers and scissors, and even molecular nanocars. However, the motion of molecular machines is generally limited to the nanoworld only. Amplifying the motion of these systems in such a way that they would affect the macroscopic world consequently remains a major contemporary challenge. Researchers of the University of Twente's MESA+ research institute led by principal researcher

Nathalie Katsonis have risen up to this challenge. They developed spiral ribbons containing molecular nanoswitches. These spirals curl, twist, contract or expand under the influence of UV light, and might be used to perform work, for instance by shifting magnets.

Molecular nanoswitches

The spirals consist of thin strips cut from a film of liquid crystal doped with molecular switches being a couple of nanometers long (one nanometre is one millionth of a millimeter). When irradiating the spiral with UV light, the inside of the strip contracts, while the outside expands, resulting in the spiral curling up. With the passage of time, or after exposing the spiral to normal light, the material returns to its original shape.

The researchers are able to determine the original shape of the strips by choosing the angle at which they are cut in the film- they can obtain a right-handed spiral, a left-handed spiral , or even a combination of both. Consequently, it's also possible to pre-program the movements of the spirals move.

The scientists were inspired by nature for their research: The way the spirals move is similar to how plant vines curl to tether to a support and eventually reach towards the sun. These new nanostructured materials could be used to develop soft robotics, or as active wireless elements in microfluidic devices.

Provided by University of Twente