High-capacity hydrogen storage for future vehicles, and the best angle for skipping stones

Research news from the American Physical Society

Metal Coated Nanotubes and Buckyballs for Hydrogen Storage in High Tech Cars

T. Yildirim and S. Ciraci
Phys. Rev. Lett. 94, 175501, 6 May 2005
http://link.aps.org/abstract/PRL/v94/e175501

Y. Zhao et al.
http://link.aps.org/abstract/PRL/v94/e155504

Metallic coatings should lead to very small carbon structures that can store plenty of hydrogen to make nonpolluting hydrogen-powered vehicles feasible. Soccer ball-shaped buckyballs and tiny tubes of carbon atoms billionths of a meter across are capable of capturing up to 8% and 9% of their weight in hydrogen respectively, when they are coated with metals such as Titanium or Scandium. That may not sound like much, but studies have shown that hydrogen powered cars will become feasible if safe fuel tanks can hold more than 6% of their weight in hydrogen. Researchers at the National Institute of Standards and Technology in Maryland (Yildirim and Ciraci) studied the storage capacity of Titanium coated nanotubes, and researchers from the National Renewable Energy Laboratory in Colorado (Zhao et al.) studied Scandium coated buckyballs. In either case, the structures would serve as packing inside fuel tanks of clean burning hydrogen vehicles.

Magic Angle for Skipping Stones

S. Nagahiro and Y. Hayakawa
http://link.aps.org/abstract/PRL/v94/e174501

To get a stone to most easily skip across the surface of a lake, you should tilt it at about 20 degrees to the water surface, researchers have confirmed. Previous experiments had measured a "magic angle:" the angle of the stone relative to the water that minimizes the speed needed for the stone to bounce instead of sink. To better understand this phenomenon, physicists at Tohoku University in Japan have now theoretically and numerically analyzed the impact between a disk and the water. They used a numerical method called smoothed particle hydrodynamics to simulate the skipping stone, and they also derived an equation describing the disk's motion. Both methods provided a confirmation of the magic angle of about 20 degrees, in good agreement with the previous experiments. A short video of the stone skipping simulation is available on the APS Media Relations website.

Journal articles are available to journalists on request.

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American Physical Society
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