MATERIALS SCIENCE

Stanene makes its debut

Graphene's tin cousin may conduct without heat loss.

BY CHRIS CESARE

Two years after physicists predicted that tin should be able to form a mesh just one atom thick, researchers report that they have made it[1]. The thin film is called stanene (from the Latin *stannum* meaning tin, which also gives the element its chemical symbol, Sn) and is the latest cousin of graphene, the honeycomb lattice of carbon atoms that has spurred thousands of studies into related 2D materials (see *Nature* **522,** 274–276; 2015).

In theory, stanene has a talent that graphene does not: at room temperature, electrons should be able to travel along the edges of the tin mesh without colliding with other electrons and atoms as they do in most materials. This makes the film what physicists call a topological insulator, and means that it should be able to conduct electricity without losing energy as waste heat, according to predictions[2] made in 2013 by Shou-Cheng Zhang, a physicist at Stanford University in California, who is a co-author of the latest study.

A thin film of stanene might be the perfect highway along which to ferry current in electric circuits, says Peide Ye, a physicist and electrical engineer at Purdue University in West Lafayette, Indiana. "I'm always looking for something not only scientifically interesting but that has potential for applications in a device," he says. "It's very interesting work."

But Zhang and his colleagues at four universities in China cannot yet confirm stanene's predicted exotic properties. Experimentalists at Shanghai Jiao Tong University created the mesh by vaporizing tin in a vacuum and allowing the atoms to waft onto a supporting surface made of bismuth telluride. Although this surface allows 2D stanene crystals to form, it also interacts with them, creating the wrong conditions for a topological insulator, says Zhang. He has already co-authored another paper[3] examining which surfaces would work better. ■

1. Zhu, F. F. *et al. Nature Mater.* http://dx.doi.org/10.1038/nmat4384 (2015).
2. Xu, Y. *et al. Phys. Rev. Lett.* **111,** 136804 (2013).
3. Xu, Y., Tang, P. & Zhang, S.-C. Preprint at http://arxiv.org/abs/1507.00419 (2015).

NOAA

Marine snails from the US West Coast show signs of shell weakening as a result of ocean acidification.

OCEAN ACIDIFICATION

Seawater studies come up short

Experiments fail to predict size of acidification's impact.

BY DANIEL CRESSEY

As the oceans' chemistry is altered by rising levels of atmospheric carbon dioxide, the response of sea-dwellers such as fish, shellfish and corals is a huge unknown that has implications for fisheries and conservationists alike. But the researchers attempting to find an answer are often failing to properly design and report their experiments, according to an analysis of two decades of literature.

Oceans absorb much of the CO_2 emitted by human activities such as coal burning. This leads to a variety of chemical changes, such as making waters more acidic, which are referred to as ocean acidification.

The United Nations has warned that ocean acidification could cost the global economy US$1 trillion per year by the end of the century, owing to losses in industries such as fisheries and tourism. Oyster fisheries in the United States are estimated to have already lost millions of dollars as a result of poor harvests, which can be partly blamed on ocean acidification.

The past decade has seen accelerated attempts to predict what these changes in pH will mean for the oceans' denizens — in particular, through experiments that place organisms in water tanks that mimic future ocean-chemistry scenarios.

Yet according to a survey published last month by marine scientist Christopher Cornwall, who studies ocean acidification at the University of Western Australia in Crawley, and ecologist Catriona Hurd of the University of Tasmania in Hobart, Australia, most reports of such laboratory experiments either used inappropriate methods or did not report their methods properly (C. E. Cornwall and C. L. Hurd *ICES J. Mar. Sci.* http://dx.doi.org/10.1093/icesjms/fsv118; 2015).

Cornwall says that the "overwhelming evidence" from such studies of the negative effects of ocean acidification still stands. For example, more-acidic waters slow the growth and worsen the health of many species that build structures such as shells from calcium carbonate. But the pair's discovery that many of the experiments are problematic makes it difficult