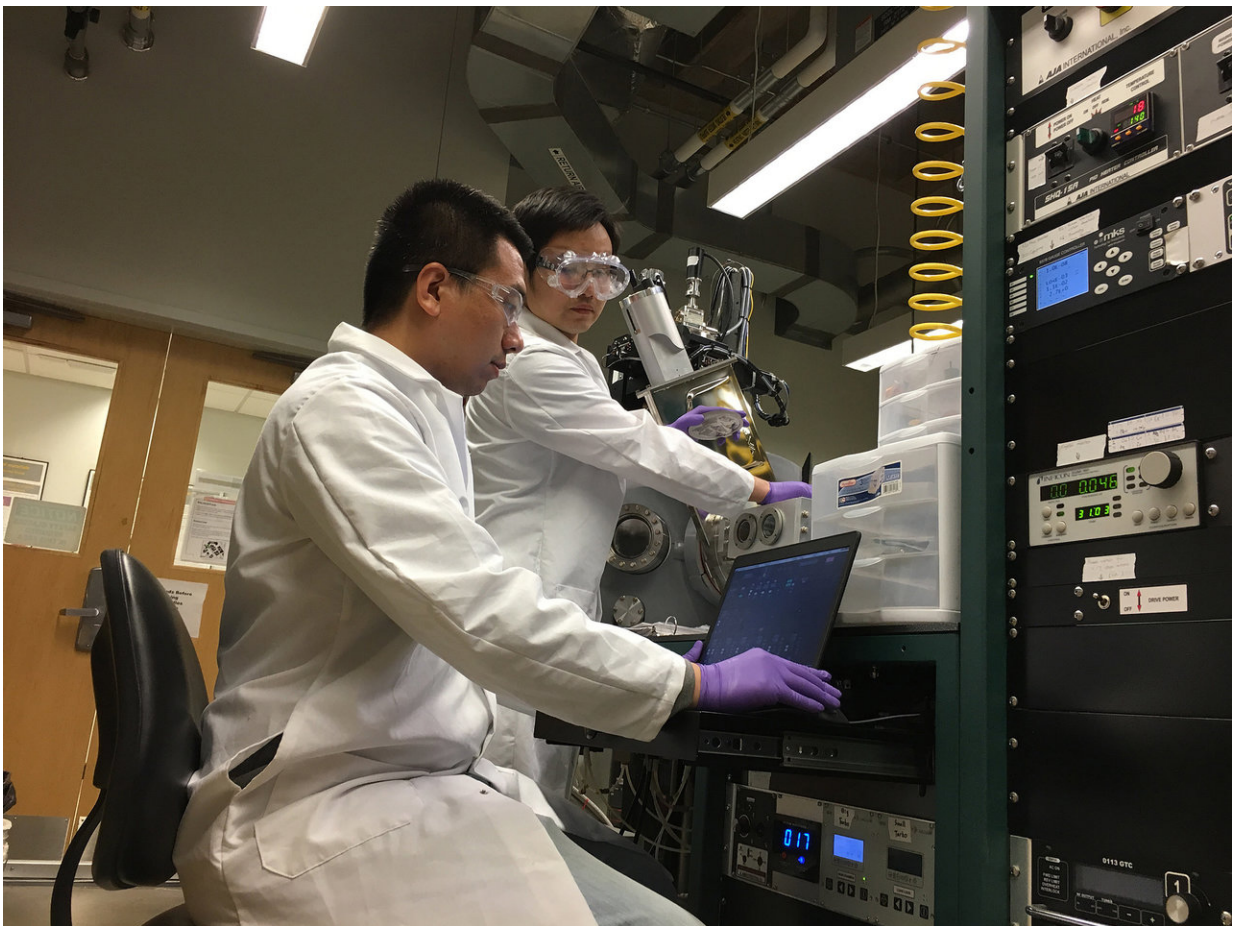


Superstrong Al alloys may change manufacturing processes for automobiles, aerospace devices

June 29 2018



In this photo, Qiang Li makes a deposition program on the operational computer, and Yifan Zhang loads samples into a sputtering chamber to prepare high-strength Al alloy coatings. Credit: Purdue University

Purdue University researchers have developed a superstrong material that may change some manufacturing processes for the aerospace and automobile industries.

The Purdue team, led by Xinghang Zhang, a professor in Purdue's School of Materials Engineering, created high-strength [aluminum alloy](#) coatings. According to Zhang, there is an increasing demand for such [materials](#) because of their advantages for automakers and aerospace industries.

"We have created a very durable and lightweight [aluminum](#) alloy that is just as strong as, and possibly stronger than, stainless steel," Zhang said. "Our aluminum alloy is lightweight and provides flexibility that [stainless steel](#) does not in many applications."

Another member of the Purdue team, Yifan Zhang, a graduate student in [materials engineering](#), said the aluminum alloy they created could be used for making wear- and corrosion-resistant automobile parts such as engines and coatings for optical lenses for specialized telescopes in the aerospace industry.

Purdue researchers create the super-strong aluminum alloy by introducing "stacking faults," or distortions in the crystal structure of aluminum. Such distortions can lead to so-called nanotwins and complex stacking faults, such as 9R phase.

"The 9R type of stacking fault is usually rare in aluminum," said Qiang Li, a doctoral student and member of the research team. "We introduce both twin boundaries and 9R phase within nanograins to the lightweight Al [alloys](#) that are both strong and highly deformable under stresses. Besides coating applications, we are also looking into scale-up potentials of bulk high-strength Al alloys."

The team also created a way to develop the superstrong alloy coatings by introducing iron or Ti atoms into aluminum's crystal structure. The resulting "nanotwinned" aluminum-iron alloy coatings proved to be one of the strongest aluminum alloys ever created, comparable to high-strength steels. The findings were published recently in *Advanced Materials* and *Scripta Materialia*.

More information: Y.F. Zhang et al. Microstructure and mechanical behavior of nanotwinned AlTi alloys with 9R phase, *Scripta Materialia* (2018). [DOI: 10.1016/j.scriptamat.2018.01.010](https://doi.org/10.1016/j.scriptamat.2018.01.010)

Qiang Li et al. High-Strength Nanotwinned Al Alloys with 9R Phase, *Advanced Materials* (2018). [DOI: 10.1002/adma.201704629](https://doi.org/10.1002/adma.201704629)

Provided by Purdue University

Citation: Superstrong Al alloys may change manufacturing processes for automobiles, aerospace devices (2018, June 29) retrieved 23 April 2024 from <https://phys.org/news/2018-06-superstrong-al-alloys-automobiles-aerospace.html>

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