

WHICH IS THE TOUGHEST MATERIAL EVER DEVELOPED?

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Scientists have measured the highest toughness ever recorded of any material while investigating a metallic alloy made of chromium, cobalt, and nickel. Not only is the metal exceptionally strong and ductile — which, in materials science, means highly malleable and impressively strong (meaning it resists permanent deformation) — its strength and ductility improves as it gets colder.

This runs counter to most other materials in existence. CrCoNi is a subset of a class of metals called high entropy alloys (HEAs). All the alloys in use today contain a high proportion of one element with lower amounts of additional elements added, but HEAs are made of an equal mix of each constituent element. These balanced atomic recipes appear to bestow some of these materials with an extraordinarily high combination of strength and ductility when stressed, which together make up what is termed “toughness”.

The toughness of this material near liquid helium temperatures (20 kelvin, -424 Fahrenheit) is as high as 500 megapascals square root metres. In the same units, the toughness of a piece of silicon is one, the aluminium airframe in passenger airplanes is about 35, and the toughness of some of the best steels is around 100, says release.

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