

New diamond harder than a jeweller's diamond, cuts through ultra-solid materials

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Diamond in the anvil the scientists used to make the nano-sized Lonsdaleite.
Credit: Jamie Kidston, ANU

The Australian National University (ANU) has led an international project to make a diamond that's predicted to be harder than a jeweller's diamond and useful for cutting through ultra-solid materials on mining sites.

ANU Associate Professor Jodie Bradby said her team - including ANU PhD student Thomas Shiell and experts from RMIT, the University of Sydney and the United States - made nano-sized Lonsdaleite, which is a hexagonal diamond only found in nature at the site of meteorite impacts such as Canyon Diablo in the US.

"This new diamond is not going to be on any engagement rings. You'll more likely find it on a mining site - but I still think that diamonds are a scientist's best friend. Any time you need a super-hard material to cut something, this new diamond has the potential to do it more easily and more quickly," said Dr Bradby from the ANU Research School of Physics and Engineering.

Her research team made the Lonsdaleite in a diamond anvil at 400 degrees Celsius, halving the temperature at which it can be formed in a laboratory.

"The [hexagonal structure](#) of this diamond's atoms makes it much harder than regular [diamonds](#), which have a cubic structure. We've been able to make it at the nanoscale and this is exciting because often with these materials 'smaller is stronger'."

Lonsdaleite is named after the famous British pioneering female crystallographer Dame Kathleen Lonsdale, who was the first woman elected as a Fellow to the Royal Society.

The research is published in *Scientific Reports*.

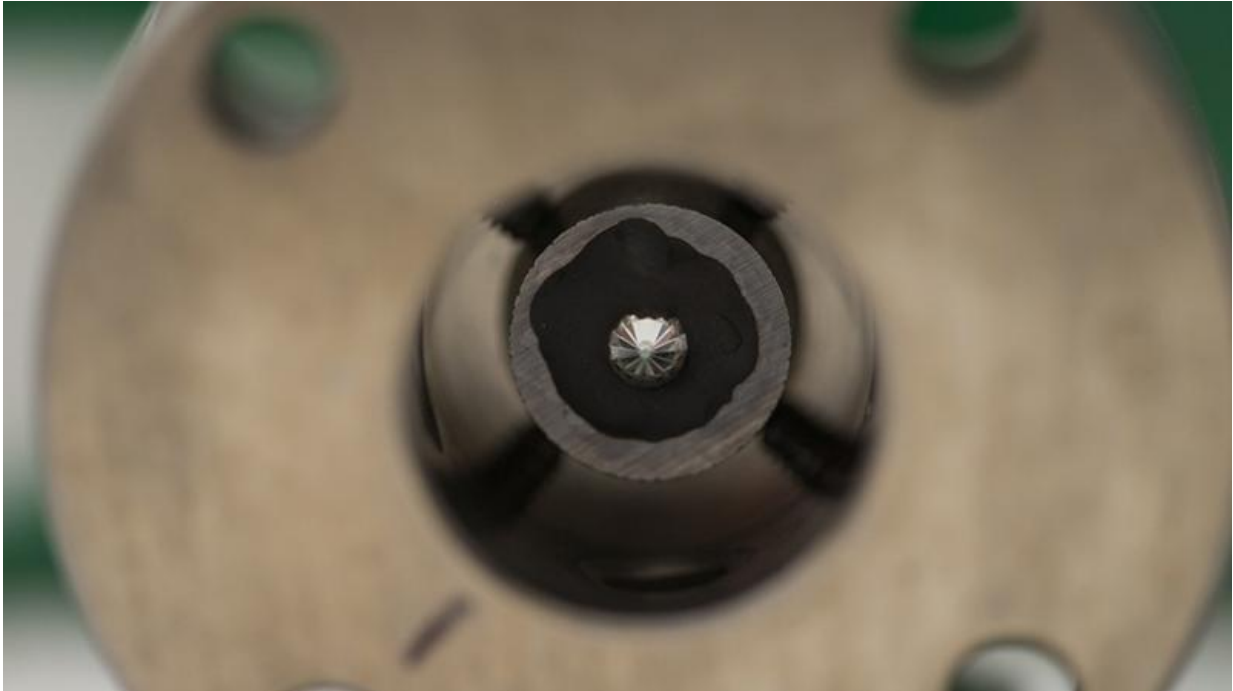
Co-researcher Professor Dougal McCulloch from RMIT said the collaboration of world-leading experts in the field was essential to the project's success. "The discovery of the nano-crystalline hexagonal diamond was only made possible by close collaborative ties between leading physicists from Australia and overseas, and the team utilised

state-of-the-art instrumentation such as electron microscopes," he said.

Corresponding author from the University of Sydney, Professor David McKenzie, said he was doing the night shift in the United States laboratory as part of the research when he noticed a little shoulder on the side of a peak. "And it didn't mean all that much until we examined it later on in Melbourne and in Canberra - and we realised that it was something very, very different."



Associate Professor Jodie Bradby. Credit: Jamie Kidston, ANU



The diamond anvil the scientists used to make the nano-sized Lonsdaleite.
Credit: Jamie Kidston, ANU

More information: Thomas. B. Shiell et al. Nanocrystalline hexagonal diamond formed from glassy carbon, *Scientific Reports* (2016). [DOI: 10.1038/srep37232](https://doi.org/10.1038/srep37232)

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