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# Curtin scientists' crystal discovery sheds new light on impact craters

MEDIA RELEASE

Tuesday 16 August 2016

Researchers from the WA School of Mines, Curtin University have discovered rare, microscopic crystals at Meteor Crater in the United States, which are providing new insights into impact events on Earth and elsewhere in the solar system.

The detection of the incredibly stable crystals, known as granular zircons, represents the first new shocked mineral discovery at Arizona's famous Meteor Crater in more than 50 years.

The crater is 1.2 kilometres in diameter and was formed some 49,000 years ago, making it one of the youngest known. It is similar in both size and age to the Wolfe Creek Crater, located in Western Australia, which formed about 300,000 years ago.

The international study, led by Dr Aaron Cavosie, Dr Nick Timms and PhD candidate Timmons Erickson from the WA School of Mines, used electron backscatter diffraction to decipher for the first time how a granular variety of the mineral zircon formed as the high pressure shockwave passed through the target rocks.

This discovery has led to new interpretations on the impact histories of other sites where the granular zircon has been found, including at other impact craters on Earth such as the 600 million-year-old Acraman impact in South Australia; in lunar samples returned by NASA's Apollo missions to the Moon; and also in meteorites.

Dr Cavosie explained the granular zircons could withstand temperatures of more than 2,000 degrees Celsius and were regarded as one of the best isotopic clocks for dating geological processes such as ancient asteroid impacts billions of years old.

"Our research shows the granular zircons were subjected to pressures in excess of 30 gigapascals (or 300,000 atmospheres) and temperatures near 2,000

degrees Celsius, which are conditions only created in the Earth's crust by impacts," Dr Cavosie said.

"Rocks on planetary surfaces melt or vaporise at these conditions, but with zircon, the extreme pressure and temperature causes it to first twin, and then change into another mineral called reidite. It then recrystallises back to zircon, preserving its unusual geological history."

Dr Cavosie explained this 'geological history' was what researchers interpreted to understand the transformational process and environmental conditions that the zircon experienced.

"The most amazing aspect is that all the transformations necessary to form this mineral took place in a matter of seconds, not even minutes, during a very violent process," Dr Cavosie said.

He said the rare find came as a bit of a surprise to the scientists as more than half a century had passed since any new shocked minerals had been found at Meteor Crater – one of the most highly studied impact craters on Earth.

"We suspected that zircon was present in the target rocks but it had not been reported previously," Dr Cavosie said.

"Now, when we find granular zircon in a meteorite, it will allow us to recreate the conditions that the meteorite experienced on its path to Earth. It also will provide new insights into extreme impact conditions at inaccessible sites, such as the surface of the Moon and collisions among asteroids."

The new study has been published in the journal *Geology*.

The full research paper, *Transformations to granular zircon revealed: Twinning, reidite, and $ZrO_2$ in shocked zircon from Meteor Crater,* can be found at:
http://geology.gsapubs.org/content/early/2016/07/19/G38043.1.full.pdf+html
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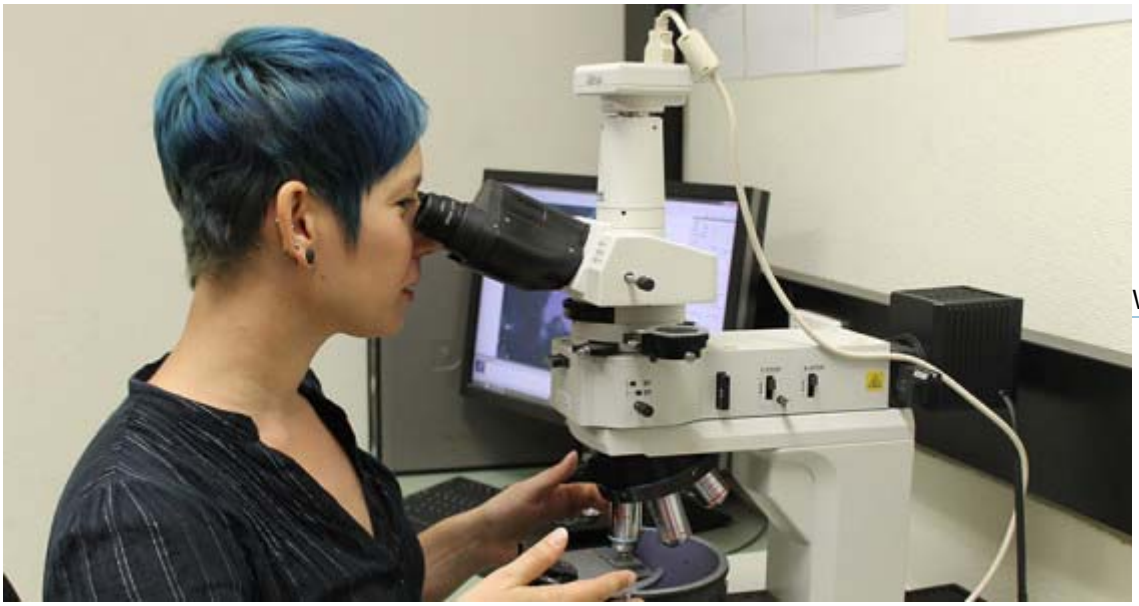

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