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SCIENTISTS FIND A MINERAL SEEN IN THE DEPTHS OF THE EARTH IN A METEORITE

Relevant for: Geography | Topic: The Earth and the Solar System

Molten core: Bridgmanite is the most abundant mineral of the Earth's interior. | Photo Credit: Aman Verma

The key findings of a study led by IIT Kharagpur researchers could help us understand the formation and evolution of the Earth. They have studied a meteorite that fell near the town of Katol in Nagpur District of Maharashtra on May 22, 2012, reporting for the first time, presence of veins of the mineral bridgmanite, which is the most abundant mineral in the interior of the Earth, within the Katol L6 Chondrite meteorite. This finding adds evidence to the Moon-forming giant impact hypothesis.

"Bridgmanite is the most volumetrically abundant mineral of the Earth's interior. It is present in the lower mantle (from 660 to 2700 km), and it is important to understand its formation mechanism to better comprehend the origin and evolution of planetary interiors," says Sujoy Ghosh, Department of Geology and Geophysics, Indian Institute of Technology Kharagpur, who designed the study and is the lead author of the paper published in *Proceedings of the National Academy of Science (the U.S.).*

The Moon-forming giant impact hypothesis is that long ago, nearly 4.5 billion years ago, the Earth collided with a planet the size of Mars named Thela, and the force of this impact was so huge as to melt the Earth down from the surface to a depth of 750 km to 1,100 km. The hypothesis goes that this caused the Earth to be bathed in a magma ocean, and the ejecta from the collision led to the formation of the Moon.

This is the most favoured hypothesis on the formation of the Moon and the present finding by the Kharagpur team lends further support to it.

"Earth was an ocean of magma in the past. The heavier iron and nickel went to the core while the lighter silicates stayed in the mantle. By studying the meteorite, we can understand more details about the formation of the Earth and other planets," says Kishan Tiwari, research scholar from the Department of Geology and Geophysics, Indian Institute of Technology Kharagpur and an author of the paper, in an email to *The Hindu.*

"Bridgmanite consists of magnesium, iron, calcium aluminum oxide and has a perovskite structure," says Dr Ghosh. He further explains that while the crystal structure of natural bridgmanite has been reported in other meteorites such as the Tenham and Suizhou meteorites, their chemical composition does not fully match with the terrestrial bridgmanite present in the Earth's interior between 660 and 2700 km depth.

"Our findings led to numerous other advances to understand how the Earth's core formed about 4.5 billion years ago," says Dr Ghosh. This finding could also help investigations of high-pressure phase transformation mechanisms in the deep Earth, which the group is planning to continue in future studies.

Does the knowledge of nerve impulses which can perceive temperature and pressure when initiated help to treat pain?

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