



Katol Meteorite

 drishtiias.com/printpdf/katol-meteorite

Why in News

Recently, some researchers studied a **meteorite from Katol**, Maharashtra which was from the meteor shower of 2012.

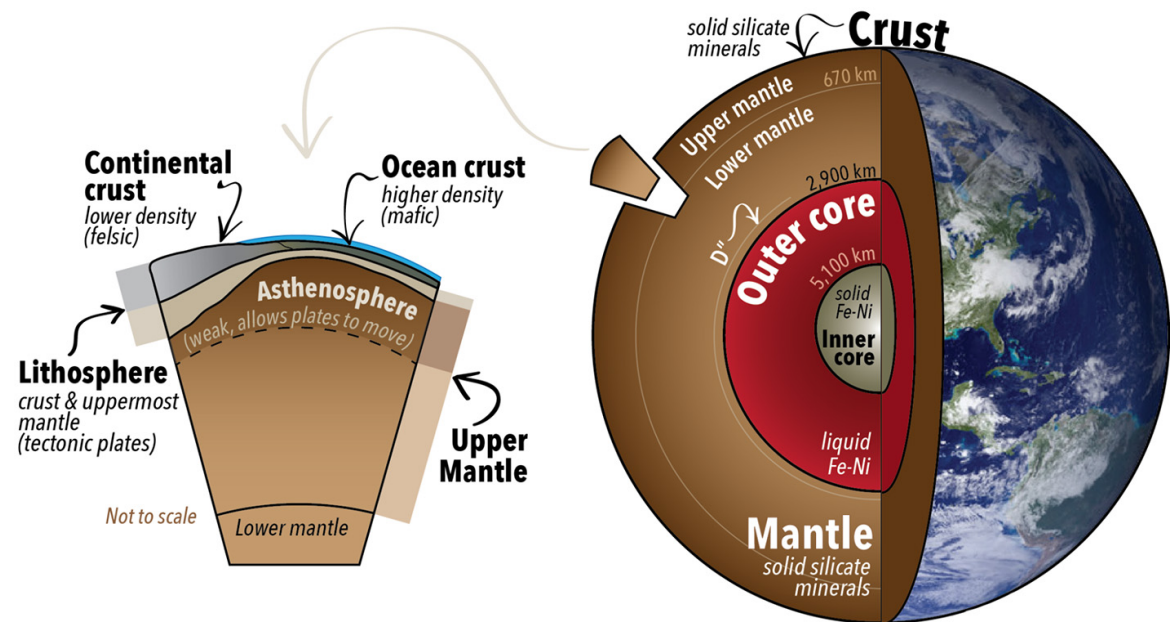
A **meteorite** is a solid piece of debris from an object, such as a **comet**, **asteroid**, or **meteoroid**, that originates in outer space and survives its passage through the atmosphere to reach the surface of a planet or moon.

Key Points

- **Findings:**
 - **Depth of Olivine:**
 - Initial studies revealed that the **host rock was mainly composed of olivine, an olive-green mineral.**
 - **Olivine is the most abundant phase in our Earth's upper mantle.**
Earth is composed of different layers including the outer **crust**, followed by the **mantle** and then the inner **core**.
 - It was believed that we can reach the **upper mantle if we drill for about 410 kilometers.**
 - However, by studying the composition of these meteorite fragments, researchers have unravelled the composition expected to be present in the **Earth's lower mantle which is at about 660 km deep.**
 - **Formation of Bridgmanite:**
 - Various computational and experimental studies have shown that about **80% of the Earth's lower mantle is made up of bridgmanite.** By studying this meteorite sample, **scientists can decode how bridgmanite crystallized** during the final stages of our Earth's formation.
 - **Bridgmanite** is a magnesium-silicate mineral, $MgSiO_3$, the most abundant mineral on earth.
 - The mineral was **named in 2014 after Prof. Percy W. Bridgman**, recipient of the 1946 **Nobel** Prize in Physics.
 - As the **bridgmanite of the Katol meteorite** sample closely **matches** with the **bridgmanite on Earth.**
- **Bridgmanite on Earth vs Meteorite:**
 - The bridgmanite in the meteorite was found to be formed at **pressures of about 23 to 25 gigapascals generated by the shock event.**
 - The high temperature and pressure in our Earth's interior have **changed over billions of years** causing crystallisation, melting, remelting of the different minerals before they reached their current state.
- **Significance:**
 - Studying the meteorite could also **tell us more about how our Earth evolved** from being a magma ocean to a rocky planet and researchers can unearth more details about the formation of Earth.
 - It is important to study these individual minerals to get a thorough idea of **how and when the Earth's layers formed.**
 - Scientists can also **decode how bridgmanite crystallized** during the final stages of our **Earth's formation.**

Formation of Inner Planets (Earth)

- The inner planets or terrestrial planets or rocky planets **Mercury, Venus, Earth, and Mars** are formed by accretion or by rocky pieces coming together and forming a planet by increased pressure and high temperature caused by radioactive elements and gravitational forces.
- Earth was an **ocean of magma** before the elements crystallised and stabilised and the **different layers such as core, mantle and crust** were formed.
The **heavier elements like iron** went to the **core** while the lighter silicates stayed in the mantle.



Source: IE