

Lab-Grown Diamonds

Prelims: Lab-Grown Diamonds, Naturally Occurring Diamonds, Allotrope of Carbon, HPHT Method, CVD Method.

Mains: Lab-Grown Diamonds and its Significance

Why in News?

The Ministry of Finance (MoF) in its 2023-24 Union Budget has put special emphasis on **Laboratory-Grown Diamonds (LGD)**.

 Scientists working at a General Electric research laboratory in New York are credited with the creation of the world's first-ever LGD in 1954.

What are Laboratory-Grown Diamonds?

About:

- LGD are manufactured in laboratories, as opposed to naturally occurring diamonds.
 However, the chemical composition and other physical and optical properties of the two are the same.
- Naturally occurring diamonds take millions of years to form; they are created when carbon deposits buried within the earth are exposed to extreme heat and pressure.

Manufacturing:

- They are mostly manufactured through two processes, High Pressure, High Temperature (HPHT) method or Chemical Vapour Deposition (CVD) method.
- Both HPHT and CVD methods of growing diamonds artificially begin with a seed, a slice of another diamond.
 - In the HPHT method, the seed, along with pure graphite carbon, is exposed to temperatures around 1,500 degrees Celsius and extremely high pressure.
 - In the CVD method, the seed is heated to around 800 degrees Celsius inside a sealed chamber filled with a carbon-rich gas. The gas sticks to the seed, gradually building the diamond.

Applications:

- They are used for industrial purposes in machines and tools and their hardness and extra strength make them ideal for use as cutters.
- Pure synthetic diamonds are used in electronics as a heat spreader for high-power laser diodes, **laser arrays and high-power transistors.**

Significance:

- The **environmental footprint** of a diamond grown in a laboratory is **much lesser than** that of a naturally occurring diamond.
- According to a report by Diamond Foundry, an environmentally conscious LGD
 manufacturer, it takes ten times more energy to extract a natural diamond from the
 earth than it takes in creating one above the ground.
- Open-pit mining, one of the most common methods of mining naturally occurring

diamonds, involves moving tonnes of earth and rock to extract these precious stones.

What is the Scenario of India's Diamond Industry?

- India is the world's largest cutting and polishing center for diamonds, accounting for over 90% of polished diamond manufacturing globally. This is attributed to factors such as the easy availability of high skilled labour, cutting-edge technology, and lower costs involved.
 - Surat in Gujarat is a global hub for diamond manufacturing.
 - The US is the biggest market for cut and polished diamonds, with China a close second.
- India contributes 19% of the total diamond exports in the world.
- The UAE is also the largest export destination for Indian gold jewellery, accounting for over 75% of the South Asian country's jewellery exports.
- India's overall exports of gems and jewellery in November 2022 were USD 2.43 billion, up 2.05 % from the same year-ago period.

What are the Government Initiatives to Promote Lab-Grown Diamond?

- The 2023 Union Budget promises to reduce the basic customs duty on seeds used in the manufacture of lab-grown diamonds in a bid to popularise their production in India— the duty on seeds for rough LGDs will be reduced from 5% to nil.
- A five-year research grant will also be provided to one of the Indian Institute of Technologies (IITs) for research and development in the field of LGDs.
- MoF has also proposed the creation of new tariff lines to help in better identification of a The Vision number of products, including synthetic diamonds. The aim of the move is to help facilitate trade as well as to have clarity on availing concessional import duty.

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