

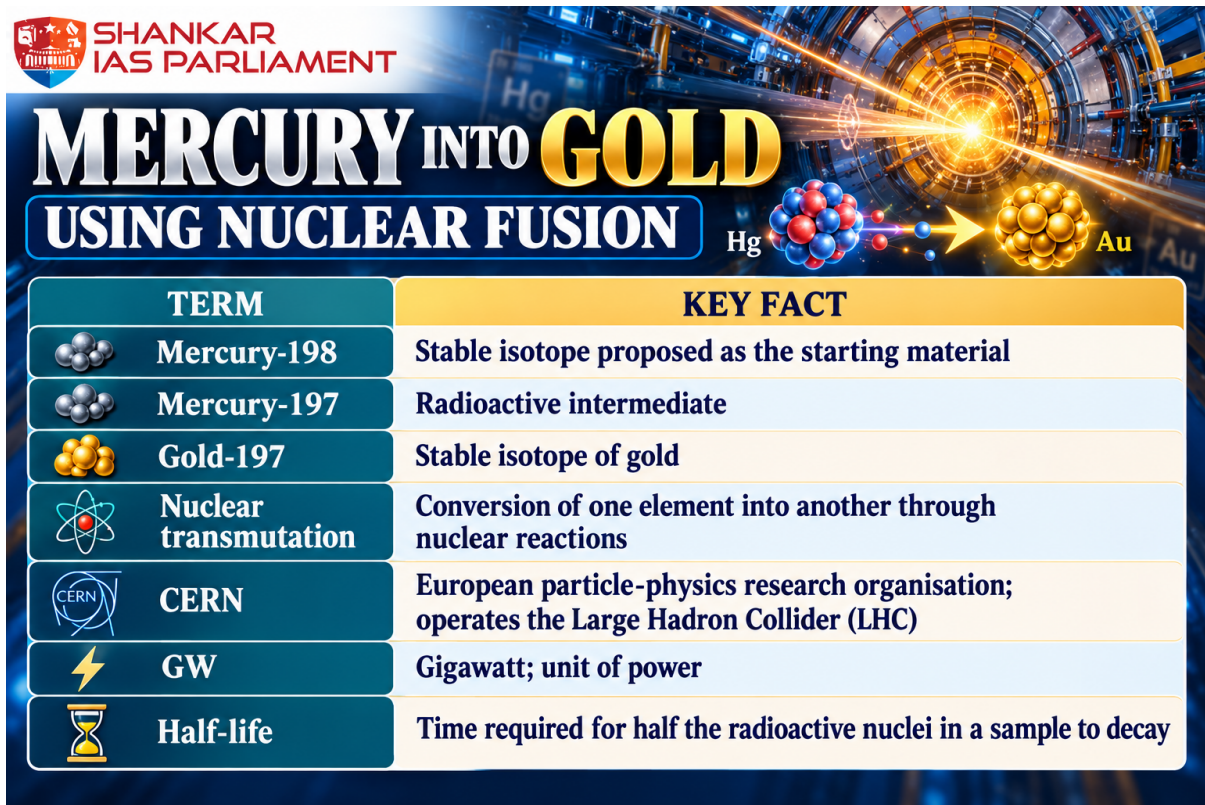
Mercury into Gold Using Nuclear Fusion

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Why in News?

Recently, Marathon Fusion, a company based in San Francisco, reported the successful conversion of mercury into gold through experimental procedures.

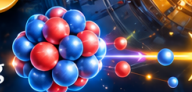
- The proposed method utilizes neutrons produced by nuclear fusion to convert mercury-198 into gold-197.



SHANKAR IAS PARLIAMENT

MERCURY INTO GOLD

USING NUCLEAR FUSION

Hg  Au

TERM	KEY FACT
 Mercury-198	Stable isotope proposed as the starting material
 Mercury-197	Radioactive intermediate
 Gold-197	Stable isotope of gold
 Nuclear transmutation	Conversion of one element into another through nuclear reactions
 CERN	European particle-physics research organisation; operates the Large Hadron Collider (LHC)
 GW	Gigawatt; unit of power
 Half-life	Time required for half the radioactive nuclei in a sample to decay

Scientific Principles

- Nuclear fusion** - It refers to the process in which light atomic nuclei combine, resulting in the release of energy and high-energy neutrons.
- Nuclear transmutation** - It involves the conversion of one element into another through alterations in its atomic nucleus.
- Proposed Process**
 - Mercury-198 absorbs high-energy neutrons generated during the fusion process.

- This absorption transforms mercury-198 into radioactive mercury-197.
- Radioactive mercury-197 subsequently decays into stable gold-197.

Seven Caveats Concerning the Claim

- **Absence of Direct Fusion** - Gold production is achieved through nuclear transmutation rather than the fusion of mercury or gold nuclei.
- **Insufficient Evidence** - Independent verification, comprehensive experimental methodologies, and publicly established data on gold quantity and purity are lacking.
- **Comparison with CERN** - CERN has produced minimal quantities of gold nuclei via lead-ion collisions for research purposes rather than commercial production.
 - Marathon's assertion of a tenfold improvement is not substantiated by sufficient public evidence.
- **Disparity in Scale** - The projected annual output of 2 tonnes of gold per gigawatt of thermal fusion power is derived from simulations rather than demonstrated by a commercial reactor.
- **Challenges with Mercury** - The process necessitates mercury enriched to 90% mercury-198 and requires specialized handling because of mercury's significant toxicity.
- **Radioactivity Concerns** - The resulting gold mixture may contain radioactive isotopes and could require extended periods of radioactive decay or purification.
- **Economic Uncertainty** - Assertions regarding the doubling of fusion plant revenue are contingent upon hypothetical future reactor performance, as well as uncertain gold prices and production costs.

Reference

[The Hindu | Turning Mercury into Gold with Nuclear Fusion](#)