



Colloquium

Electrochemistry and nuclear fusion meet inside a coin

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Abstract :

A central challenge in nuclear fusion research is achieving the fuel particle confinement required to sustain reactions. In the 1980s, researchers hypothesized that electrolyzing heavy water could create a high-density deuterium environment to induce fusion. Although early attempts were unsuccessful, the extreme density achievable through electrochemistry remains a compelling avenue of study. In this talk, we present experimental results from a benchtop system demonstrating how condensed matter chemistry can influence nuclear processes. By bombarding a palladium target with deuterium ions during active electrochemical loading, we observed a $15(2)\%$ enhancement in the deuterium–deuterium (D–D) fusion reaction rate. This finding provides direct evidence that chemical manipulations at the electronvolt (eV) scale can measurably alter nuclear processes at the megaelectronvolt (MeV) scale, opening a direction for compact, solid-state-assisted fusion research.