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Exploration of single-atom alloy nanocatalysts for high-performance ammonia electrooxidation

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The global warming crisis, largely driven by rising carbon dioxide emissions, necessitates innovative solutions to mitigate its impact. Among the promising strategies under investigation is the utilization of ammonia fuel cells or ammonia electrolytic cells. Ammonia, a carbon-free substance with a higher energy density than hydrogen, offers significant advantages in terms of handling and transport. Unlike traditional energy systems that rely on organic materials and produce carbon dioxide as a byproduct, ammonia-based systems are inherently eco-friendly. However, a major challenge in optimizing ammonia fuel cells is the instability of the anodic ammonia oxidation reaction (AOR). The catalyst required for this reaction is susceptible to poisoning from nitrogen-based intermediates, such as adsorbed nitrogen (Nads) and adsorbed nitric oxide (NOads). This poisoning effect hampers the efficiency and longevity of the catalyst. Recent research has explored the introduction of transition metals into the catalyst matrix as a potential solution to this issue. Transition metals like Ni and Cu have shown promise in enhancing the stability of the catalyst by mitigating the effects of poisoning. Although the precise mechanisms by which these metals improve resistance to poisoning are not fully understood, their beneficial impact is well-documented. In our research, we have examined the effects of incorporating various transition metals at the atomic level onto platinum nanocubes. By testing these modified catalysts, we aim to better understand their effectiveness in facilitating the ammonia oxidation reaction and improving overall performance. This approach could provide a significant advancement in the development of more efficient and durable ammonia-based energy systems.

Paper submission Plan

No

Best Presentation

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Contribution track

ICABU WG4. Applications of Particle Beams

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