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PROCEEDINGS

Highly Efficient and Stable Catalysts Customized by Ultrafast-Laser in Porous Crystals

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ABSTRACT

The loading capacity, spatial arrangement, and structural stability of monatomic catalysts have significant effects on their performance. Traditional physical and chemical methods cannot precisely control the adsorption, reduction, and anchoring of metal salt ions, making it challenging to achieve accurate synthesis of metal single atoms in three-dimensional space. This project aims to use porous crystal materials as the adsorption carrier for metal salt ions and lasers as the energy source for accurate reduction. This approach facilitates the precise synthesis and customization of single atoms in multidimensional space. By designing the pore size, morphology, particle size, topological structure, and defect content of porous crystals, the impact on single atom distribution, loading, and bonding is investigated. Synchrotron radiation and spherical electron microscopy are employed to explore the reduction and anchoring of single atoms in porous crystals, resulting in the identification of patterns in multi-dimensional pore space and single atom loading and bonding. The research delves into the catalytic performance of single-atom catalysts under extreme reaction conditions, providing experimental models for understanding structural-activity relationships, including active sites, electron transport, and synergies constructed by multi-element single-atom catalysts. Investigating these scientific challenges is crucial for a comprehensive understanding of the physicochemical properties of monatomic evolution in porous crystals, with the potential to develop new monatomic catalysts with high loading capacity and stability.

KEYWORDS

Precise material fabrication; laser micro-nano processing; crystal; single-atom catalyst

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