Lehrstuhl für Energiesysteme
TUM School of Engineering and Design
Technische Universität München

ZAE BAYERN

Semesterarbeit

(Experimentell)

Ammonia-Fed Solid Oxide Fuel Cells for Green Power Generation
Investigation of Nickel Nitride Formation in Ni-YSZ Anodes

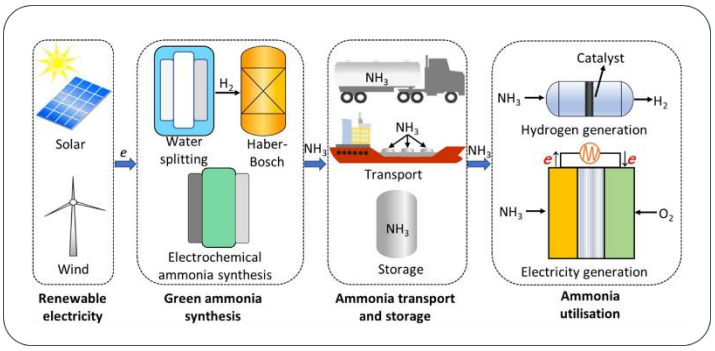
Description:

Solid Oxide Fuel Cell (SOFC) technology is widely acknowledged as one of the most efficient energy conversion technologies. Despite the high efficiency of this technology, however, SOFCs are not employed widely due partially to the underdeveloped infrastructure of hydrogen. To overcome the challenges associated with the storage and transport of hydrogen, ammonia is considered a quite promising hydrogen carrier owing to its appealing thermo-physical properties. Besides, ammonia can be directly utilized in SOFCs, and such a system offers extremely high system efficiencies. However, the direct utilization of ammonia in SOFCs also has some challenges. The formation of Nickel Nitride (Ni_3N) and the related microstructure changes within the Ni-YSZ anodes of SOFCs are reportedly the most crucial ones. If the formation of Ni_3N and the changes in the microstructure of Ni-YSZ can be prevented, this can be a significant contribution to the direct ammonia-utilizing SOFC technology.

In this study, the main goal is to figure out under what conditions Ni-YSZ anodes of SOFCs can be operated without Ni_3N formation. To achieve this goal, TGA (Thermogravimetric Analysis) of the Ni-YSZ anodes will be carried out under certain conditions. After the TGA, the Ni-YSZ anodes will be inspected using SEM (Scanning Electron Microscopy) and EDX (Energy-dispersive X-ray Spectroscopy) techniques to observe the changes within microstructures of the anodes. Eventually, the study will reveal under what conditions SOFCs possessing Ni-YSZ anodes can be safely operated, which will support the development of the direct ammonia-utilizing SOFCs.

Work Packages:

- TGA of the Ni-YSZ anodes under various conditions
- Inspection of the Ni-YSZ anode microstructures using SEM and EDX techniques



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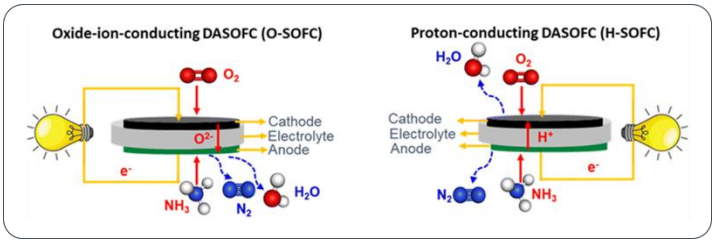

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