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Isoporous LaFeO3 catalysts for green hydrogen generation

The development of technologies for H2 production from waste resources plays a crucial role in the decarbonization of the hydrogen supply chain. This study investigated the fabrication of nanostructured LaFeO3 catalysts for H2 generation from biogas, emphasizing thermal processing strategies aiming at producing highly-porous structures with high gas permeability, surface area, and catalytic activity. LaFeO3 nanoparticles, synthesized via a sol-gel route, are combined with polystyrene (PS) monodisperse sacrificial templates to create an interconnected isoporous microstructure. A critical two-stage thermal treatment is performed: (i) the controlled debinding of the PS template to generate the highly-porous interconnected structure, and (ii) a co-reduction sintering process to promote the exsolution of metallic Fe nanoparticles. Reduction parameters are tailored to control the dispersion and size of Fe active sites emerging from the perovskite lattice while preventing excessive sintering that would destroy the porous structure. Unlike conventional impregnation methods, exsolution yields anchored nanoparticles with hypothesized redox reversibility, facilitating easy catalyst recovery. The correlation between sintering conditions and the resulting pore morphology is assessed. By optimizing the exsolution and sintering profiles, this research aims to produce high-efficiency, long-life catalysts that mitigate carbon poisoning during the reforming of complex biofuels.

Professional Status of the Speaker

Doctoral or Master Student

Interest in submitting a paper in a special issue of

No interest

Invitation letter for visa

No

Author: ASSIS DA ROCHA, Bruno (Karlsruhe Institute of Technology (KIT), Institute for Applied Materials – Ceramic Materials and Technologies (IAM-KWT))

Co-authors: Prof. HOTZA, Dachamir (Chemical and Food Engineering Department (EQA), Federal University of Santa Catarina (UFSC)); Prof. GÓMEZ GONZÁLEZ, Sergio Yesid (Chemical and Food Engineering Department (EQA), Federal University of Santa Catarina (UFSC)); Prof. PAGNAN FURLAN, Kaline (Karlsruhe Institute of Technology (KIT), Institute for Applied Materials –Ceramic Materials and Technologies (IAM-KWT))

Presenter: ASSIS DA ROCHA, Bruno (Karlsruhe Institute of Technology (KIT), Institute for Applied Materials –Ceramic Materials and Technologies (IAM-KWT))

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