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ICC9



A B S T R A C T
B O O K

Synthesis and characterization of Ba(Fe,Zr,Ni)O₃ perovskites for potential application in electrochemical NO_x decomposition

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Abstract:

Emissions of nitrogen oxides remain a significant problem associated with the use of fuel-efficient lean combustion in transportation (diesel engines) and the passivation of catalytic converters by excess oxygen in exhaust gasses. One possible way to achieve high-efficiency NO_x conversion is electrochemical reduction under anodic polarization in symmetrical solid oxide cells. Recent research was focused on improving efficiency in the presence of 1-15 vol.% oxygen: seeking for NO_x selective electrodes based on mixed-conducting transition metal oxides, impregnations with basic components (BaO, BaCO₃, K₂O) to enhance adsorption of acidic NO_x or pre-oxidation of NO to NO₂ which is more readily adsorbed on the electrode surface. The present work is focused on the synthesis of Ba-rich Ba(Fe,Zr,Ni)O₃ perovskites and characterization of their electrical properties, phase stability, and thermomechanical behavior with the aim to assess the prospects of their use as electrocatalysts for NO_x elimination.

Ba(Fe_{1-x-y}Ni_xZr_y)O_{3-δ} (x = 0.05–0.5, y = 0–0.4) ceramics were synthesized by glycine-nitrate combustion technique. Single-phase perovskites with a minor NiO impurity were found to form only for prevailing Fe content and with the total Ni and Zr content x+y ≤ 0.3 at 1100°C. Sintering at T ≥ 1200°C leads to segregation of secondary phases. The electrical conductivity of single-phase ceramics is moderate and reaches 3.5 S/cm at 400-500°C; this may limit electrochemical performance. The perovskite phase is demonstrated to be stable in reducing conditions down to pO₂ ~ 10⁻¹⁶ atm. The dilatometric studies show unusual and nonlinear behavior of thermal expansion coefficients, with the absolute values varying in the range of 15-50 ppm/K at 250-950°C.

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15:30 – 15:50	Tomasz Brylewski (Poland) – Functional steel/composite ceramics layered systems for interconnects applied in electrochemical energy conversion devices
15:50 – 16:10	Magdalena Kosiorek (Poland) – 3D printing as an economical and efficient method for fabricating solid oxide cell (SOC) stacks sealings
16:10 – 16:30	Sherly Novia Sari (Poland) – The influence of sintering method on electrical properties of BaCeO ₃ -based composite protonic conductors
16:30 – 17:00	Coffee break
17:00 – 18:20	Symposium G
17:00 – 17:20	Arijeta Bafti (Croatia) – Development of geopolymer network and following influence on conductivity properties
17:20 – 17:40	Kiryl Zakharchuk (Portugal) – Synthesis and characterization of Ba(Fe,Zr,Ni)O ₃ perovskites for potential application in electrochemical NO _x decomposition
17:40 – 18:00	Zoltán Lenčéš (Slovakia) – Translucent/transparent spinel phosphors for solid state lighting and photocatalytic applications
18:00 – 18:20	Donatella Giuranno (Italy) – Polymer-Derived Ceramic materials for novel ultrahigh-temperature latent-heat thermal energy storage device

Hall S4D

14:30 – 16:30	Symposium D
14:30 – 14:50	Mattia Muracchioli (Italy) – High Shear Wet Granulation of Geopolymer and Geopolymer-Zeolite powders for CO ₂ adsorption
14:50 – 15:10	Souhaila Nider (Belgium) – Creation of porous ceramics with hierarchical pores using capillary suspensions for bone tissue engineering
15:10 – 15:30	Kevin Tedjokusuma (Germany) – Filtration Performance of Highly Porous Glass Filters Made from Capillary Suspensions
15:30 – 15:50	Eveline Zschippang (Germany) – Influence of cost-efficient Si ₃ N ₄ powders on the microstructure formation of alpha/beta Sialons prepared via an aqueous processing route
15:50 – 16:10	Moritz Weiß (Germany) – FastCast – open porous ceramics
16:10 – 16:30	Xinyu Li (China) – Porous metakaolin/slag-based geopolymer adsorbent synthesized by a water-soluble template
16:30 – 17:00	Coffee break
17:00 – 18:20	Symposium D
17:00 – 17:20	Pedro Henrique Da Rosa Braun (Germany) – Designing the pore morphology of SiOC freeze-cast structures using solvent mixtures
17:20 – 17:40	Christos Agrafiotis (Germany) – Reticulated porous perovskite structures for implementation of cyclic redox-based thermochemical gas-solid reactions
17:40 – 18:00	Swantje Simon (Germany) – Additive Manufactured Replica Foams
18:00 – 18:20	Cristina Elena Ciomaga (Romania) – Influence of porosity on dielectric, ferroelectric and pyro-, piezoelectric properties for Ba _{0.85} Ca _{0.15} Ti _{0.90} Zr _{0.10} O ₃ porous ceramics