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Endorsed by: SHS-AS – International Association on Self-Propagating High-Temperature Synthesis Member of the Institute of Topical Associations of the World Academy of Ceramics

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Ceramic Chemical Sensors: An Overview

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Gas Sensing Properties of TiO₂ and SnO₂ Nanopowders Obtained through Gel Combustion

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Microstructural Control of Composite Anode for Anode Supported Intermediate Temperature Solid Oxide Fuel Cells

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Pseudocapacitive Manganese Oxide Prepared by a Spray Pyrolysis/Electrostatic Deposition Technique

C.Y. Chen, C.K. Lin, Y.R. Lyu, H.H. Lin and W.H. Tuan

1896

Make Hydrogen while the Sun Shines: The Photoelectrolysis of Water Using Oxide Semiconductors
K. Rajeshwar, C.R.N. Chenthamarakshan, N.R. de Tacconi and S. Somasundaram 1902

J-3 – Ceramics in Nuclear Fusion and Fission

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Zirconia Inert Matrix for Plutonium Utilisation and Minor Actinides Disposition in Thermal Reactors
C. Degueldre 1907

Advanced Radiation-Resistant Ceramic Composites
Y. Katoh, L.L. Snead, T. Nozawa, N.B. Morley and W.E. Windes 1915

Thermodynamic Study of Al-Li-O-Zr: Experimental Results and Thermodynamic Assessment
I. Drouelle, S. Chatain, C. Guéneau, P. Zeller, D. Hamon and C. Toffolon-Masclat 1925

Thermochemical and Thermophysical Properties of Advanced Fission Fuel Materials
K. Minato, M. Takano, T. Nishi, M. Akabori, Y. Arai and M. Uno 1931

Mixed Lithium-Boron Materials
J.S. Joy 1941

Thermodynamic Modelling of the Uranium-Carbon-Oxygen System in the Frame of the Uranium Oxide and Carbon Interaction in the TRISO Fuel Particle of High Temperature Reactor
J.C. Dumas, J.P. Piron, S. Chatain and C. Guéneau 1944

J-3.2 Radiation Damage and Radiation Effects

Restructuring of Nuclear Oxide Fuel under High Burnup Irradiation
M. Kinoshita 1952

Radiation Damage Effects in Insulators for Fusion Reactors: Microstructure Evolution in MgO-Al₂O₃ System Oxide Crystals
K. Yasuda and S. Matsumura 1961

A First Principles Study of Palladium Impurities in Silicon Carbide
G. Roma 1969

Electrical Conductivity of Proton Conductive Ceramics under Reactor Irradiation
T. Shikama, B. Tsuchiya, S. Nagata and K. Toh 1974

Reducing Hydrogen Penetration through Corrosion Layer Formed on Zirconium Alloys by Iron Addition
K. Kakiuchi, K. Okubo, N. Itagaki, A. Miyazaki, Y. Ishii, S. Suzuki, T. Terai and M. Yamawaki 1980

J-3.3 Ceramics in Radioactive Waste Management

Processing Ceramics for Radioactive Waste Immobilisation
W.E. Lee, J. Juoi, M.I. Ojovan and O.K. Karlina 1986

Influence of Noble Metal Particles on Redox Reactions on Uranium Dioxide Surfaces
M.E. Broczkowski, J.S. Goldik, J.J. Noël and D. Shoesmith 1996

Single Phase Ceramic Wasteforms for Plutonium Disposition
N.C. Hyatt, M.C. Stennett, E.R. Maddrell and W.E. Lee 2004

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Synthesis and Characterisation of BaMIV(PO₄)₂ in the View of Conditioning of the Actinides
K. Popa, R.J.M. Konings, D. Bouëxière, A.F. Popa and T. Geisler 2012

Immobilization of Hafnium Surrogates in Fluorapatite
S.K. Fong, L.A. Gerrard, B.L. Metcalfe and I.W. Donald 2018

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