

**Title Numerical Modelling of Transport Phenomena
in SOFC Systems**

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in Energy Engineering
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Place I2CNER hall, I2CNER Bldg.1, Ito campus, Kyushu University

Abstract

At the current level of energy consumption, the industrial-scale reserves of fossil fuels around the globe are sufficient for around 100 years more. The international projects involving fusion (ITER) or the exploitation of hydrates may yield answers allowing for practical, applicable solutions within 50 years with actual implementation then following by the end of the 21st century. In the meantime, if global energy security is to be assured and levels of pollution reduced, it will be advisable to bring “third-generation” power-supply technologies into full(er) use in the upcoming years and Solid Oxide Fuel Cell (SOFC) has the potential to become one of the most important types of an energy conversion device.

However, high-temperature operation, thermal management of the SOFC system becomes an important issue. The temperature distribution is a critical factor in terms of cell lifespan, including degradation of electrodes microstructure. Proper thermal management requires detailed modelling, including numerical analysis of the transport phenomena within an SOFC system. Various mathematical models have been developed to solve transport equations coupled with electrochemical processes to describe the reaction kinetics accounting for internal reforming chemistry in SOFCs. In recent years, the SOFC technology has made significant progress – notably, in considering electrodes’ microstructure morphology, as well as in providing miniaturized and efficient methane steam reforming. A number of contributions on these critical topics will be discussed. The objective of this talk is to summarize the present status of the SOFC modelling efforts and their impact on understanding and optimization of SOFC systems.

About the Speaker

Prof. J. Szmyd received MSc from the AGH University of Science and Technology (AGH) in 1977. He has been employed since 1980 at AGH University of Science and Technology, where he received Ph.D. (1980) as well as D.Sc. (1992) degrees, and professor position (1995). In 2002 he received Professor title (title Professor given by President of Poland) and in 2005 Full Professor position given by Minister of Higher Education in Poland. He received title Doctor Honoris Causa, Shibaura Institute of Technology, Tokyo, Japan in 2015.

He has published more than two hundred fifty scientific papers on Numerical Simulation of Heat and Mass Transfer, Turbulent Flows and Turbulent Heat Transfer, Interactive Computational and Experimental Methodologies, Convection in Czochralski Melt Systems, Magnetic Convection, Solid Oxide Fuel Cell Systems, Energy and Exergy Analysis, gave more than seventy seminars and invited lectures (outside of Poland).

He is representative of Poland and President to EURO THERM Committee (European Committee for the Advancement of Thermal Sciences and Heat Transfer). He is member of the Assembly of World Conferences on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics. He is vice chairman of Commission on Threats to Civilization, Polish Academy of Arts and Sciences.

Host: Professor Yasuyuki Takata

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