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SOLID OXIDE FUEL CELLS- HIGHLY EFFICIENT AND ENVIRONMENTALLY FRIENDLY ELECTROCHEMICAL DEVICES FOR THE ENERGY SUPPLY OF THE FUTURE

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Increasing energy consumption requires new solutions that offer both high efficiency and clean energy generation. A great share of electrical energy is produced from fossil fuels, which continued use contributes to the greenhouse effect. Alternatively, a certain amount of the energy demand could be fulfilled in a more environmentally friendly manner by using volatile renewable energy. Its integration into the energy system is not possible without appropriate energy storage systems and results in significantly reduced overall efficiency. Solid oxide fuel cell systems (SOFCs) appear to be a promising technology that provides direct conversion of the chemical energy of gaseous fuels into electrical energy without additional conversion steps, with high efficiency and low pollution. The high operating-temperatures and very good catalytic performance enable a high degree of fuel flexibility, in addition to the internal reforming of hydrocarbons. The high-quality heat that is by-product of SOFCs can be used to heat single-family houses, or for industrial processes, thus increasing their overall efficiency. Thus, SOFCs have emerged as the most efficient fuel cell technology.This work will address topic of a future-oriented fuel cell technology and it will introduce its basic principles. They involve the working principle and typical losses that detract from the fuel cell maximum efficiency. Furthermore, the electrochemical characterization techniques and analysis methods used for the electrochemical in-situ investigation will be introduced and discussed. Eventually, this work will provide answers to several important questions: What are fuel cells? How do they work? How can fuel cells improve our energy supply, and? how well can the emission reduction objective be achieved when using this technology?

Biography

Vanja Subotic is assistant professor and the head of the fuel cell research group at the Institute of Thermal Engineering at Graz University of Technology. She has set his research focus on high temperature processes, including solid oxide fuel and electrolysis cells (SOFC/SOEC), their short- and long-term degradation, their numerical representation via CFD simulations, as well as online monitoring and development of methods for restoring performance of SOFC/SOEC systems. She received her PhD at Graz University of Technology, for which she examined various degradation mechanisms and the possibilities for their detection by applying advanced electrochemical methods, in addition to developing novel strategies for carbon removal and restoring cells' performance in a cell-protecting manner.

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