

## **DESCRIPTION FOR THE GENERAL PUBLIC**

Fuel cells enable generation of electricity from fuels containing hydrogen, methane, carbon monoxide and other combustible gases. Conversion of the chemical energy of gas into electricity is done in an electrochemical process, with a very high process efficiency, higher than obtained in gas-engines and even in modern power plants. Thanks to that, it becomes possible to generate electricity with significantly lower emissions of harmful gases and lower fuel consumption.

The gaseous fuel for the investigated solid oxide fuel cells (SOFC) can come from gasification of coal, biomass or waste. This kind of gas is a mixture of hydrogen, methane, carbon monoxide, carbon dioxide and nitrogen. Frequently, such gas contains contaminations such as entrained particulate matter (e.g. fly ash, soot, etc.). Up to now, the influence of the particulate matter contaminated fuel on the SOFC has not been systematically studied.

The project is devoted to investigation of processes occurring in a SOFC fuelled by a particulate-rich gaseous fuel. The impact of presence of chemically inert dusts will be studied for various concentrations. Additionally, the experiments with a mixture of inert and carbonaceous powders suspension will be carried out to simulate the real particulates in post-gasification gases.

In parallel to experimental investigation a mathematical description of the occurring phenomena will be developed, followed by its numerical solution tuned to match the experimental results. This will allow to draw particular conclusions regarding the assessment of the influence of the particulate-contaminations on the SOFC operation and will be a milestone towards determining the resistance of this type of fuel cells for particulate matter in fuels.