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"Effect of Inlet Air Temperature and Relative Humidity on PEM Fuel Cell Performance"

Abstract. In this research the influence of inlet air temperature and relative humidity on performance of a PEM Fuel Cell stack with maximum power of 175 W. In order to control the inlet air temperature, a cooling system was designed and implemented. Changing the inlet air temperature in the range between 10°C and 30°C, it was experimentally proved that the lower temperature results in better fuel cell performance. This dependence was found to be non-linear.

Next step of the research was to take into account the air humidity and to analyze the cooling effect on membrane productivity. For this purpose, an air humidifier and a sensor were installed into the inlet channel. Experiments showed that the efficiency of the system is increasing with the growing relative humidity.

CFD simulation of the reactants flow inside the FC stack was conducted, helping to analyze thermal regime, velocity distribution and migration of hydrogen ions through the membrane on a cathode side. Using experimental data, it was detected that temperature on cathode side exceeds operational limits already at 120W power load.

Bio. **Aleksandra Sveshnikova**

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Research interests: Renewable energy, Smart grid systems, Fuel cell technology, energy efficiency.

Kirill Abrosimov

Kirill graduated from Bauman University in 2014 majoring in alternative energy plants and gas turbines. He also worked on solar energy theme project. His diploma work was dedicated to small modular biogas station with a gas turbine of non-conventional thermodynamic cycle as power machine. At Skoltech Kirill's focus of research is studying mechanical part of energy systems.