

# Abstract for non-expert public

Electrochemical sensors and detectors are compact, portable, inexpensive, user-friendly and highly attractive devices for detection and quantification of various chemical species. They are widely applied for monitoring pollutants in the environment, drinking water and ambient air, for food analysis and quality control, and most importantly in clinical laboratories and medicine in general. However, in the field of gas detection, the broader application of electrochemical gas sensors is still in its infancy. Non-invasive clinical diagnostics, homeland security, occupational and environmental concerns have given rise to increasing research efforts aiming to develop analytical techniques for fast, sensitive, and simple determination of, for example, gaseous hydrogen peroxide. Therefore, a wider utilization of such sensors for gaseous-phase environments is yet to be achieved.

The proposed project focuses on the development of **portable, fast and reliable hydrogen peroxide ( $H_2O_2$ ) electrochemical gas sensors capable of on-site detection**. Elevated concentrations of gaseous  $H_2O_2$  in the exhaled breath have been associated with some severe diseases like lung cancer and asthma. Another example of a need to detect low concentrations of gaseous  $H_2O_2$  is its malicious use in the production of improvised explosive devices.

$H_2O_2$  has many uses in the chemical, food and paper industry as a powerful oxidising agent and/or bleach; it can also be a vital component of rocket fuel, waste-water treatment, organic and inorganic synthesis, and as an effective disinfectant. It is therefore a very important compound to be monitored in connection with occupational risk in the industries where it is mostly used. The proposed gas sensors will be designed as small portable devices, easily installed indoors or outdoors. In this project proposal, we expect to have an impact on improving the proposed gaseous  $H_2O_2$  sensing and make it more accessible for many applications that significantly increase the quality of life and safety.

The proposal brings together a **Slovenian research group from the National Institute of Chemistry**, experienced in electrochemical gas sensorics and synthesis of functional materials, and a **Polish group from the Department of Inorganic and Analytical Chemistry at the University of Łódź**, experienced in the development of state-of-the-art electrochemical techniques for advanced research in the field of mechanisms and kinetics of electrode reactions, and analytical determination at trace levels. The proposal assumes a combination of experimental, easily applicable work and fundamental, theoretically supported research, to meet the final project goal, i.e., **preparation of an efficient and simple electrochemical sensor for detection of  $H_2O_2$  in the gas phase**.