

SCIENTIFIC REPORT

PURPOSE OF VISIT

The visit was the continuation of collaboration between the Department of Experimental Physics, Comenius University and Department of Physics and Astronomy, Open University. The purpose of research stay was the upgrading experimental apparatus built earlier followed by investigation of the effect of presence of water vapours in carbon dioxide ozone production by negative and positive corona discharge. Moreover, the effect of the humidity on macroscopic parameters of discharges should have been studied.

DESCRIPTION OF THE WORK CARRIED OUT DURING THE VISIT

During the visit existing apparatus, which was built earlier for investigation of corona discharge and ozone produced in discharge, has been rebuilt and upgraded. The older high voltage power supply was changed for new one which is able to provide higher output power. Discharge current and voltage measurement was also upgraded. Now it is possible to perform automatic acquisition of current and voltage data directly by computer computer. It is great improvement in comparison with system of current measurement used before. System of flow controllers was added to the apparatus. It allows performing all the measurements in flowing regime when the gas mixture flows through the discharge tube at constant flow rate. The part of the apparatus which allows adding definite amount of water vapours to the gas was prepared in Bratislava at Department of Experimental Physics and brought to Open University. It was installed into the thermostat because the temperature of water has to be regulated. New hygrometer was integrated into the gas inlet system to measure the amount of water in the gas mixture accurately. The basic properties of apparatus have been tested in various regimes.

After the tests the experiments were composed conducted in static regime and flowing regime for both positive and negative corona discharge. The discharge tube was installed directly in the UV spectrometer, so it was possible to measure ozone concentration in-line in the volume of the tube. Various amounts of water vapours up to 1000 ppm were added to carbon dioxide to investigate the influence of water. In static regime the negative corona discharge was switched on for 1 hour in closed discharge tube. During this period the discharge current and ozone concentration in the tube were observed. Then the ozone decomposition was observed during next hour. This was repeated for various voltages and amounts of water. Ozone concentration and discharge current were measured in flowing regime also. Various voltages were set and then the data were measured and saved. Similar experiments were done in positive corona discharge.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

- Presence of water in the gas used to feed corona discharge influences ozone production and discharge current significantly.
- The production of ozone is more sensitive to the water concentration in positive

polarity

- The existence of critical ozone concentration at which the positive discharge was extinguished was observed. This peculiar phenomena has been never described in literature.

FUTURE COLLABORATION WITH HOST INSTITUTIONS

The experiment will be carried out till October 2005 at Comenius University in Bratislava. Products of the discharge will be analyzed by infrared spectrometry and mass spectrometry. Moreover the acquisition of data of humidity by computer will be completed. The discharge tube will be equipped with probe for measurements of gas temperature inside the discharge tube. In October 2005, during the next visit at Open University the reconstructed apparatus will be used for measurements of further data, especially by the UV spectrometry.

PROJECTED PUBLICATIONS/ARTICLES RESULTING OR TO RESULT FROM THE STSM

The preliminary data obtained during stay at Open University are analyzed at present time and will be presented in near future at scientific conference. Moreover a short paper will be prepared for publication after the completing data by IR spectrometry.