

Jan SKALNY

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REFERENCE: Short Term Scientific Mission, COST P9

Beneficiary: Jan SKALNY, Comenius University Bratislava

Host: Prof. Nigel J. Mason, Open University UK

Period: from 07/05/2007 to 18/05/2007 Place: Milton Keynes UK

Reference code: COST-STSM-P9-1455

SCIENTIFIC REPORT

PURPOSE OF VISIT

The collaboration between the Plasma Physics Division at the Department of Experimental Physics of Comenius University Bratislava and the Department of Physics and Astronomy of the Open University in Milton Keynes is successfully active several years. The different scientific projects were accomplished in collaboration between two mentioned institutions (NATO, EPIC). The research was focused to the study of electron impact processes with various gaseous molecules at ambient and also at elevated gas temperatures by using the crossed electron-molecular beams apparatus as well as to studies of macroscopic properties of corona discharges and processes initiated by such

type of gaseous discharge at atmospheric and low pressures. Recently the new plasma chemical reactor based on the corona discharge was designed and manufactured in Bratislava and finally installed at Open University in Milton Keynes. The results obtained during collaboration have been presented at many conferences and more than five papers prepared in collaboration have been already published. Several of them were recently submitted to various journals.

The recently developed apparatus installed at Open University is a simple reactor, which enabled us to use the absorption spectrometry for analysis of some compounds produced by corona discharge. The current conception is, however, not appropriate for systematic studies of all interactions produced in corona discharges with such chemical compounds.

The aim of the stay was to finalise the analysis and to prepare two papers summarising the results of experiments performed during STSM in March 2007. The consultations with Prof. Mason and members of his science group were necessary for performing of outlined plan. Secondary aim was to complete information required for reconstruction of apparatus enabling us to conduct experiments at reduced pressures. The redesigned apparatus will be used in collaboration with students from Open University and Comenius University. One reactor will be installed in future in Bratislava, where the FTIR diagnostics technique is available. Finally the third aim of the STSM was to perform experiments in corona discharges investigation the effect of humidity on properties of corona discharge in carbon dioxide and in oxygen

DESCRIPTION OF THE WORK CARRIED OUT DURING THE VISIT

The plan of activities has been fulfilled. During the stay I have finished the text of four abstracts and extended abstracts for international conferences (see the list) and finished revision of our paper submitted to Journal of Polymer Sciences. The old reactor was tested in dry and wet carbon dioxide and oxygen. The effect of relative humidity on parameters of reactor and on ozone formation were investigated. The measured data will be used at design procedure of new reactor. Moreover the small reactor for detection of ions produced in corona discharges, which had been manufactured last month in Bratislava, was tested too. This will be use in experiments planed for June. This will be performed in fy Hidden in Manchester in collaboration with people from Open University. The data collected during the stay were analysed and will be published

in early future.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

During STSM time the data necessary for construction of the new reactor were completed and raw drawing of individual parts were prepared. The reactor will enable us to use different type of high and low pressure discharge for the study of interactions of low energy electrons, negative and positive ions produced by discharges with some biomolecules including DNA. The reactor will be manufactured in workshop at Comenius University in Bratislava. Moreover the data measured in dry and wet carbon dioxide were summarised and analysed. These will be published soon. Finally the test of new reactor for measurement of ions extracted from corona discharges have shown the need of small changes in concept of this. Reactor will be modified slightly and prepare for experiments, which will be performed in fy. Hidden next month..

FUTURE COLLABORATION WITH HOST INSTITUTIONS

Collaboration will be lasted in next month when one student will continue started experiments. Analysis of results will be performed in Bratislava. The construction plans of new reactor will be completed and reactor will be manufactured in near future in Bratislava. This will be used both in Bratislava and at Open University. The aim is to study bioactive molecules in gaseous discharges. Moreover the studies of spectra of ions in presence of biomolecules in corona discharges will be performed in collaboration with fy. Hidden. The collaboration will be bordered to researchers from Department of genetics of Faculty of natural Sciences Comenius University Bratislava should analyze the degradation of DNA induced by particles produced by corona discharges..

PROJECTED PUBLICATIONS/ARTICLES RESULTING OR TO RESULT FROM THE STSM

During the STSM three abstract and extended abstracts for international conferences have been submitted

- 1. The effect of humidity on the properties of DC positive and negative corona discharges fed by CO₂: Ozone generation in dry and wet CO₂.**

J. D. Skalný, J. Országh, Š. Matejíček and N. J. Mason

Paper will be presented at conference CEIDP in Canada, October 2007

2. Mass Spectrometric Analysis of Ions Formed in Air-fed Corona Discharges

J. D. Skalny

Contribution has been presented at conference Frontiers 2007. This is extended abstract.

3. Ozone Formation in Positive and Negative Corona Discharges Fed by Mixtures CO₂ + O₂

J.D. Skalny J. Orszagh, G. Horvath, S. Matejcik, N. J. Mason

Paper will be presented at ISAPS 07 in Nikko, Japan this year.

4. Mass Spectrometry of Ions Extracted from Air Corona Discharges

J. D. Skalny

Paper will be presented as Invited Lecture at conference Plasma 2007 at Greifswald, Germany, October this year

Jan Skalny

Bratislava 18 May, 2007.

CONFIRMATION BY THE HOST INSTITUTE OF THE SUCCESSFUL EXECUTION OF THE MISSION

The visit of Prof. Jan Skalny was underdone with success and in accordance with the planed activities.

Prof. Nigel J. Mason

Milton Keynes, 18 May, 2007.