

SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: CA 17136 INTAIRPOLLNET

STSM Request reference number: ECOST-STSM-Request-CA17136-44804

STSM title: Chemical analysis of organic/elemental carbon and ionic species from particulate matter

STSM start and end date: 15/07/2019 to 26/07/2019

Grantee name: Renata Kovacevic

PURPOSE OF THE STSM:

(max.200 words)

In the course of this Short Term Scientific Mission, the candidate will be introduced with techniques for the determination of organic/elemental carbon and ionic species from particulate matter which has been carried out at the Environmental Research Laboratory of INRASTES, NCSR Demokritos, Athens, Greece.

Study the presence, levels and distribution of organic and elemental carbon in particular matter will be the main task of this STSM. Also, the introduction with the chromatography technique for the determination of ionic species from particulate matter will be the other task of this STSM.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

(max.500 words)

I started with a 10 day STSM at the Environmental Research Laboratory of INRASTES, NCSR Demokritos in Athens, Greece on Monday 15th July and finalized it Friday 26th July. My main intention here was to get be introduced with the activities in the Institute regarding the analysis of particulate matter, especially the determination of organic/elemental carbon and ionic species and to look for opportunities to collaborate.

At the beginning of my STSM, Dr. Thomas Maggos, who is an Senior Researcher at Environmental Research Laboratory of INRASTES, provided me a good working atmosphere in his research group and introduced me with their facilities and current work.

I was introduced with the principle of technique and used procedures according to which an analysis of organic/elemental carbon is conducted. I was trained for independent performance analysis by Dikaia Saraga, Research Associate. During this period, the concentration of

organic/elemental carbon were determined from more than 70 samples of particulate matter (PM_{2.5} and PM_{1.0}) using Carbon analyzer, model Sunset Laboratory. Optimization of operating parameters, recording instrument Blank and standard solution (sucrose) was preceded every day before analysis of particulate matter.

During 2nd week of my STSM, I was introduced with the principle of ion chromatography technique which has been used for the chemical characterization of ionic species (cations and anions) in particulate matter.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

Characterization of OC/EC content and ionic species in outdoor and indoor environment could improve our understanding about the air quality and about the sources of outdoor and indoor air pollutants.

In this sense, more than 70 samples of particulate matter (PM_{2.5} and PM_{1.0}) collected during the winter campaign 2018 in Serbia, were analyzed, presence and concentrations of organic and elemental carbon were determined.

According to the recorded data the content of organic carbon was in range from 0.76 to 26.7 $\mu\text{g}/\text{m}^3$ while the concentrations of elemental carbon were approximately 4-15 times lower than OC. The data will be added to already existing data on the heavy metal content and will be used for receptor modeling (positive matrix factorization PMF 5.0) in order to identify potential sources of air pollution at urban-industrial site of the town of Bor, in the vicinity of copper smelter.

During 2nd week, a water-soluble ions, both anions and cations (Na⁺, K⁺, Mg²⁺, Ca²⁺, Cl⁻, Br⁻, SO₄²⁻, NO₃⁻) are detected using suppressed ion chromatography (IC). In particular, a DIONEX DC ICS- 5000 system is used for the evaluation of ions concentrations, since it offers a full range of Reagent-Free™ IC (RFIC™) components. RFIC-EG combines automated eluent generation and self-regenerating suppression. Regarding the chemical process elaborated, Tissue Quartz filter becomes subject to ultrasonic extraction, using 6 mL of Milli-Q water and 0.5 mL isopropanol. Then, the solution is injected to the ionic chromatographer. The LOD ranged between 0.01 and 0.11 $\mu\text{g mL}^{-1}$ for anions and between 0.01 and 0.33 $\mu\text{g mL}^{-1}$ for cations. Uncertainty (95%, k = 2) ranged between 5.61% and 9.31% for anions and between 2.63% and 10.7% for cations.

FUTURE COLLABORATIONS (if applicable)

The planned output of this STSM is to prepare scientific paper with results of measured samples for international conference. Moreover, there are plans for an extension of cooperation between Mining and Metallurgy Institute Bor, Serbia and Environmental Research Laboratory of INRASTES, NCSR Demokritos, Athens, Greece in the near future.