Measuring amount of nitrogen dioxide in the atmosphere and the analysis of the accumulated data

Student: *Lia Kirtadze*

Lkirtadze4594@sdsu.edu

Chemistry, Faculty of exact and natural sciences, San-Diego State University, Kostava street 3

Supervisor: *Dr. Giorgi Jibuti*

giorgi.jibuti@tsu.ge

The research of the atmosphere pollution is one of the most important research topics. Among several different pollutants, nitrogen dioxide is widely spread. Nitrogen oxides are formed in combustion processes, partly from nitrogen compounds in the fuel, but mostly by direct combination of atmospheric oxygen and nitrogen flames. It should be noted that Nitrogen oxides are precursors of the ozone formation process and acid rains. Existence of the Nitrogen Oxides in the atmosphere is huge problem that needs to be taken into consideration. It is important to have improved methods in order to control its emission and accumulation processes into the atmosphere.

The aim of this research is to determine amount of the nitrogen dioxide into the atmosphere by using of the different methods. Widely spread method for measuring nitrogen dioxide is chemiluminescence method, which is based on the principle of chemiluminescence reaction. The process happens in the reaction vessel between NO_2 and O_3. During that reaction high energy state NO_2^* is formed. The energy emitted by the NO_2^* and it is proportional to the amount of the Nitrogen Oxide.

In this research we used both sensor and chemiluminescence methods for determining amount of the Nitrogen Oxides. The research has been conducted by using of the sensor "Flying Laboratory SOWA" from the SMART|AtmoSim_LAB of Tbilisi State University and by using of the National Environmental Agency's instrument that works based on the chemiluminescence principle ("Teledyne NOx +O3 analyzer-Model T204"). Sensor was placed on the National Environmental Agency's station and data was collected for two months. Collected data was analyzed by using of the MathWorks MATLAB and Microsoft Excel.

Accumulated data was divided into two parts: nighttime data and day-time data. Several graphs have been plotted. Nitrogen Dioxide concentration vs time graph was plotted with t and various trends has been evaluated. It should be noted that, station measured NO_2, and sensor measured NO_2 has been plotted together on the graph. Sensor data has noticeable noise and that is why the data had been smoothed by using of the MATLAB program. Based on the correlation coefficient value, it can be concluded that the data collected by the sensor and the data collected by the station chemiluminescence apparatus are quite close. It is noticeable that during two-month, sensor was working without any kind of problem while it is not created to work in this kind of regime.

Based on the collected results it can be concluded that, amount of the nitrogen dioxide is increased during the daytime period and decreased during the nighttime period. This fact most likely is the result of the transport traffic which is more intensive during the day and less intensive during the nighttime period especially due to the current corona virus pandemic restrictions. Based on the

research, we also concluded that the data collected by using of the sensor and data collected by using of the chemiluminescence apparatus is quite similar.