



MARMARA UNIVERSITY



FACULTY OF ENGINEERING

ENVIRONMENTAL ENGINEERING

DEPARTMENT

**INVESTIGATING THE CHEMICAL COMPOSITION OF
URBAN ATMOSPHERIC PARTICLES**

Büşra KÜÇÜK:150214034

Dilara AKSU:150214027

Rüveyda BÜYÜKBAŞ:150214009

ENVE 497/498

SENIOR DESIGN PROJECT

Thesis Supervisor

Dr. Öğr. Üyesi Rosa M. Flores

ISTANBUL, 2020

ABSTRACT

Atmospheric particles have important effects on human health, the environment and climate. Fine particles can penetrate the circulatory system and cause respiratory problems. Also, the particles can interact the solar radiation and water vapor and affect the energy balance by reflecting and absorbing the solar radiation and the water cycle. These effects depend on the chemical composition and the concentrations change during the day and from season to season. Fine particulate matters are mainly formed from chemical reactions in the atmosphere and from combustion of fuel, such as motor vehicles, industrial activities, agricultural burning, etc. The fine particulates (PM_{2.5}) in atmosphere are elemental carbon (EC), organic carbon (OC), water-soluble OC suggest that organic matter is a major component, followed by concentrations of nitrite, nitrate, sulfate, phosphate, and ammonia under varying meteorological conditions.

In this project, measurement of the secondary aerosol concentrations was made in four seasons throughout the year. The water-soluble ions: nitrate, sulfate, phosphate, and ammonia were extracted with water and analyzed with ion chromatography.

In winter 1 all the ions showed low concentration values and increased later measurements. After the increase they show decrease in concentrations in summer since temperature is high and reactions are not favored to produce these particles. The average PM_{2.5} concentrations was determined as 70 $\mu\text{g}/\text{m}^3$. Sulfate had the highest average concentration of 218.37 $\mu\text{g}/\text{m}^3$ and nitrite has the lowest, 1.28 $\mu\text{g}/\text{m}^3$. The effect of traffic on particulate matter (PM) composition showed when the SO_4^{-2} and nitrate concentrations are found to be lower in night samples. They were higher in weekends and rush hour in weekdays.