

## Experience (2)

### Calculation of the degree of danger for some gaseous and particulate pollutants

**Objective Of the Experiment:** Determining the degree of danger of some air pollutants present in the city's atmosphere.

#### Theoretical Part:

The seriousness of any pollutant depends on the degree of its concentration first and the extent of exposure to it secondly, but the concentration and period of exposure to the pollutant are equal, it becomes possible to arrange the air pollutants according to their severity. Carbon monoxide is the most common pollutant and can be considered as a criterion for measuring the severity of the various main pollutants [1]. Table (2-2) shows the effect factor of these pollutants in addition to the level of probability in units of mg/m<sup>3</sup>, which is defined as the highest concentration of the pollutant that can be tolerated by humans when exposed to it within one hour. The impact factor for a particular pollutant is calculated as:

$$\text{Impact Factor} = \frac{\text{probability level CO}}{\text{particular pollutant}} \quad (3-2)$$

For example, the impact factor of the SO<sub>2</sub> gas pollutant is 15.3, note Table (2-2). This figure represents a percentage that is 15 times more dangerous than CO gas if they have the same concentration. As for the degree of risk, it is given by the relationship [1]:

$$\text{Dangers degree} = \frac{\text{Concentration of any pollutant}}{\text{proplicity level}} \quad (4-2)$$

Table 2-2 probability level values and impact factors for major pollutants.

| <b>Impact factor</b> | <b>(mg/m<sup>3</sup>) proplity level</b> | <b>Gaseous and particulate pollutants</b> |
|----------------------|------------------------------------------|-------------------------------------------|
| 1                    | 5600                                     | <b>carbon monoxide(CO)</b>                |
| 15.3                 | 365                                      | <b>sulfur oxides SO<sub>x</sub></b>       |
| 21.5                 | 260                                      | <b>Particulate matter</b>                 |
| 22.4                 | 250                                      | <b>Nitrogen Oxides NOX</b>                |
| 125                  | 45                                       | <b>(Hydrocarbons (HC</b>                  |

**Materials and Tools used**

1. CO, CO<sub>2</sub>, NO<sub>2</sub>, SO<sub>2</sub> measuring devices.
2. PM<sub>2.5</sub> particulate matter measurement device.
3. Table No. (2-2) and equations (1.2) and 2.2)) from the previous experience.

**Method of Work**

1. Measure air pollutants such as CO, CO<sub>2</sub>, NOX, SO<sub>2</sub>, if any.
2. Make observations every ten minutes for these pollutants and then find the rate, and in different places inside the laboratory, in the classroom and in open areas (university garden).
3. Make a table as shown below with the following data:

| <b>measured contaminant</b>                  | <b>first measurement</b> | <b>second measurement</b> | <b>third measurement</b> | <b>pollutant concentration rate</b> | <b>stamina level</b> | <b>degree of danger</b> |
|----------------------------------------------|--------------------------|---------------------------|--------------------------|-------------------------------------|----------------------|-------------------------|
| <b>CO<sub>2</sub></b>                        |                          |                           |                          |                                     |                      |                         |
| <b>NO<sub>2</sub></b>                        |                          |                           |                          |                                     |                      |                         |
| <b>Particulate matter (PM<sub>2.5</sub>)</b> |                          |                           |                          |                                     |                      |                         |

4 . A conversion of the measured units of pollutants, for example, converting ppm to mg/m<sup>3</sup>.

5. The particulate matter is taken from a dust measuring station with a diameter of 10 μm PM<sub>10</sub> and then converted into mg/m<sup>3</sup> and compared with the probability level of CO to extract the effect factor.

### **Discussion**

Q1: Why is CO considered a measure for calculating the probability level, impact factor and impact factor in an experiment to determine the risk of some air pollutants and particulates?

Q2: What are the proportions of the danger of CO relative to the rest of the other pollutants?

Q3: What is the relationship between the level of probability and the impact factor and why?

Q4: What is the relationship between the level of probability and the degree of risk and why?

Q5: Which is more dangerous, NOX or CO at a concentration of 300 mg/m<sup>3</sup> equal to both sides?