Summary

In the present work we are interested in measuring the refractive index of some environmental pollutant gases [carbon dioxide and dichlorodifluoromethane (freon $_{12}$) gases].

The measurements carried out at different pressures from 60 to 90 cm Hg and temperatures rang from 308 to 358 k.

A Mach-Zehnder interferometer illuminated with Argon laser at 488 nm $(6.15 \times 10^{14}$ Hz) is used for measuring the value of the refractive index and it's variation with pressure and temperature.

The method is based on the shift of the interference fringes pattern caused by the change of the pressure (density) at constant temperature.

By using cauchy's equation, the relation between the refractive index and the wavelength are determined and we can get the optical dispersion curves for carbon dioxide and freon $_{12}$ gases.

Also, from the relationship between the refractive index and optical premettivity $(n^2=\varepsilon)$, and by applying Clausius-Mosotti equation we calculated some of the physical parameters such as dielectric susceptibility, specific refractivity, polarizability, radius of the molecule, pressure coefficient, and thermo-optical coefficient. Moreover by using the radius of the molecules for CO_2 gas we calculated the transport coefficients (diffusion coefficient, viscosity coefficient, and the thermal conductivity coefficient) at different pressure and temperature.

The thesis includes four chapters;

In the first chapter, we describe the main dielectric properties of gases, the transport coefficients of gases, and the optical dispersion.

In the second chapter, we describe the interference phenomena and the types of interference (multiple beam interference like Fabry-Perot

interferometer and two-beam interference like Jamin and Mach-Zehnder interferometers). Also the advantages and disadvantages and why we used Mach-Zehnder interferometer in this work .

In the third chapter, we discuss the experimental technique and the main apparatus constructed by us for measuring the refractive indices of the two environmental pollutant gases and their variation with pressure and temperature.

In the fourth chapter, we introduce the experimental results for the two gases (carbon dioxide and freon $_{12}$).

The obtained results given in this thesis should be used as a literature references for helping the researchers in the field of the optical and thermal physics.