PRESSURE EFFECT SIMULATION FOR OZONE ABSORPTION CROSS SECTION

T. C. E. Marcus*[1], M. David[2], M. Yaacob[3], M. R. Salim[4], N. Hussin[5], M. H. Ibrahim[6], N. H. Ngajikin[7], A. I. Azmi[8], S. M. Idrus[9] and Z. Buntat[10]

[1, 2,3,4,5,6,7,8,9,10]Faculty of Electrical Engineering, Universiti Teknologi Malaysia, MALAYSIA.
(E-mail: cemtay2@live.utm.my, mdavid2@live.utm.my, maslinay@uthm.edu.my, rashidi@fke.utm.my, hussin.nabihah@gmail.com, hanif@fke.utm.my, nhafizah@fke.utm.my, asrul@fke.utm.my, sevia@fke.utm.my, zolkafle@fke.utm.my)
[3]Department of Communication Engineering, Faculty of Electrical and Electronic Engineering, Universiti Tun Hussien Onn Malaysia, MALAYSIA.
(E-mail: maslinay@uthm.edu.my)

INTRODUCTION

Ozone is earth natural protective layer in atmosphere at high altitude for effective absorption of harmful ultraviolet sun rays from reaching the earth. At low altitude, ozone is generated may be generated on site for killing micro-organisms in processed rice [1]. Although ozone appears to be colourless, its presence may detected by distinct smell. Its presence near earth is tracked constantly for pollution monitoring [2]. Today, fixed and portable ozone sensor devices are commercially available for measurement of ozone. Hence, ozone plays an important role in our daily lives and should be measured accurately.

Ozone concentration has been measured in different pressure environment at high altitude using balloon [3]. Previous observation of pressure effect on ozone absorption cross section has failed to show significant relation [4]. Accurate value of absorption cross section is required for correct measurement of ozone concentration via Beer-Lambert law. Measurement of ozone concentration using maximum absorption cross section is important for maximum measurement sensitivity. Therefore, objective of this work is to establish relation between maximum absorption cross section of ozone and pressure through simulation approach.

MAIN RESULTS

Pressure effect on ozone absorption cross section is simulated using SpectralCalc.com gas cell simulator [5]. Simulation result in Figure 1 maximum peak absorption cross section stays constant at 1.148×10^{-21} m^2 $molecule^{-1}$ despite pressure changes from 0.1 atm to 3 atm. Hence, maximum absorption cross section is found to be independent on pressure. This agrees with previous work. Absorption cross section is not significantly changed when pressure varies from 100 to 1000 mbar because of short life of upper electronic state of ozone [4].

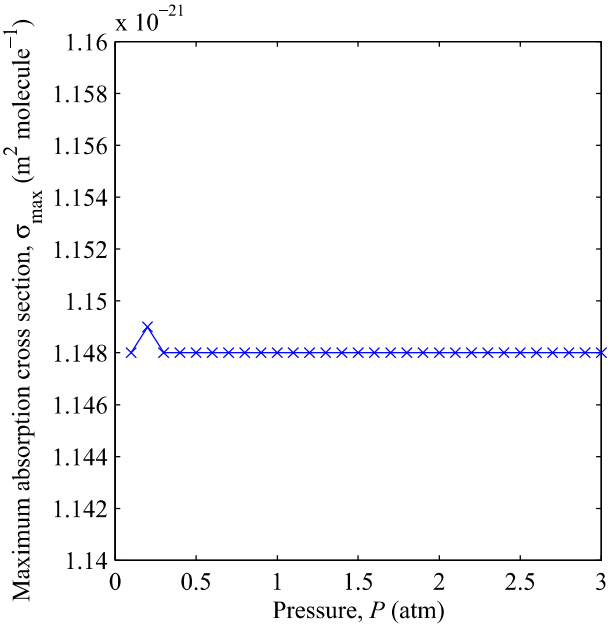

Figure 1. Graph of maximum absorption cross section versus pressure based on SpectralCalc.com simulation at concentration 123.5 ppm, temperature 300 K, optical path length 0.20 m and maximum absorption wavelength 255.442 nm

In conclusion, simulation result shows ozone maximum absorption cross section is independent of pressure changes. As a result, we recommend maximum absorption cross section for calculation of ozone concentration due to negligible pressure dependence.

Acknowledgment: The authors thank Universiti Teknologi Malaysia (UTM) for supporting this research work under Research University Grant (RUG) Scheme, grant no: 05J60 and grant no: 04H35, Fundamental Research Grant Scheme (FRGS) grant no: 4F317, and UTM Zamalah Fellowship.

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