A DIODE LASER SYSTEM FOR THE DETECTION OF ULTRA TRACE GASES

Jayantha H. Wimalasena and Leon F. Phillips*
Dept. of Chemistry, University of Sri Jayewardenepura,
*Dept. of Chemistry, University of Canterbury.

In recent years, diode laser spectroscopy has been used to detect trace gases present in the atmosphere. The technique has been used to detect gases at concentrations of upto 1 ppbv with considerable success. To improve this detection limit a system which would concentrate air before detection could be coupled to the diode laser. In the present work a trapping system was developed to concentrate air which was coupled to diode laser. The trapping system consists of a stainless steel cylinder and a wiremesh sandwiched between two brass plates which is in contact with the bottom surface of the cylinder. A heater made by winding a Nichrome wire on two mica sheets is placed on opposite sides of the wiremesh. The trapping system is connected to the multipass cell of the diode laser.

Dry air was passed through the wiremesh into the multipass cell and a diode laser absorption spectrum was taken by detecting the radiation by a cooled HgCdTe detector. The wiremesh was cooled by adding liquid N_2 into the cylinder. After sometime the heater was turned on for 10s so that all the air condensed on the wiremesh goes into the multipass cell and an absorption spectrum was taken. This procedure was repeated varying the flow rate, pressure and the flowing time to find the optimum conditions to achieve a maximum increase in concentration. With the present wiremesh a maximum of 6 fold increase in concentration was observed at a flow rate of 150 $cm^3 minute^{-1}$, a pressure of 50 torr and a flowing time of 2 hours.

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