

## Vacuum FTIR with Long Path Length Cell for the Analysis of Low Concentration Gases

### Introduction

A high S/N measurement is generally required for FTIR analysis of low concentrations of gas or vapor compounds. However the measurement of some gases can be difficult due to the presence of atmospheric water vapor and carbon dioxide present in the optical path of the instrument, even with nitrogen purging. It is especially difficult to analyze NO because the absorption band is in the same spectral region as water vapor, it is also difficult to measure NO<sub>2</sub>, CO<sub>2</sub> and CO gases, whose absorption bands are in the same region as CO<sub>2</sub> absorption. Using a full-vacuum spectrometer, water vapor and carbon dioxide in the light path can be completely eliminated and the measurement can be made at much lower concentrations.

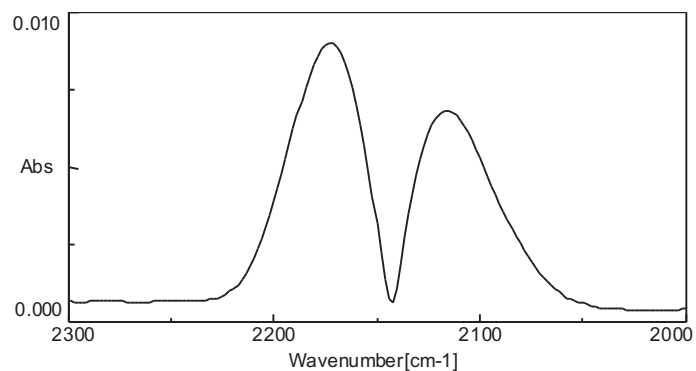
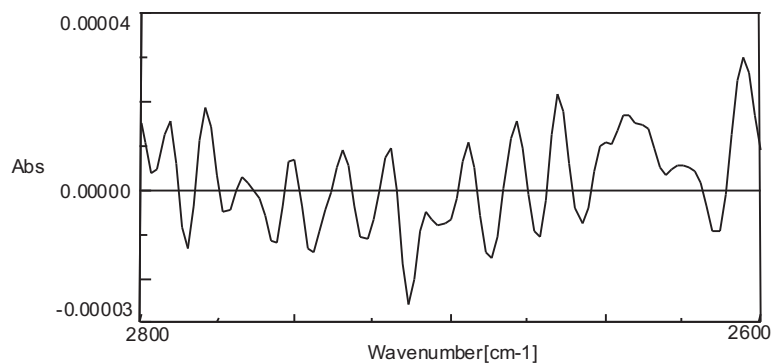
Figure 1 Spectrum of a 2 ppm CO sample in a 20 m gas cell, with a S/N approx. 200:1. Figure 2 The noise level of a spectrum measured with the same conditions is  $\sim 4 \times 10^{-5}$  Abs. At this noise level, measurement of CO gas can be easily made with concentrations as low as 20-50 ppb.

### Keywords

Vacuum FTIR long path gas cell, gas analysis, carbon monoxide Nitrogen dioxide, nitric oxide carbon dioxide CO, NO, NO<sub>2</sub> CO<sub>2</sub>

**Condition**

Resolution: 4 cm<sup>-1</sup>  
Scans: 500  
Detector: MCT  
Cell: 20m pathlength gas cell

**Figure 1.** 2 ppm CO gas**Figure 2.** Spectrum S/N with MCT detector