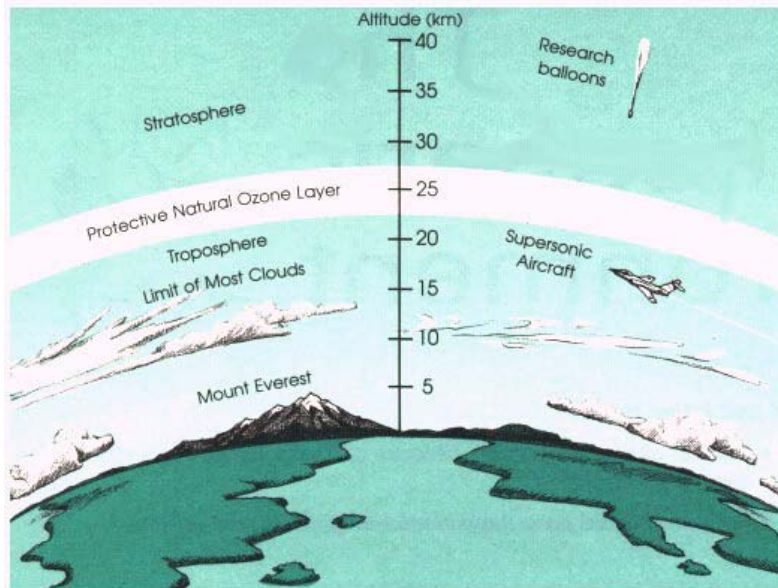


# THE ANALYSIS OF OZONE-DEPLETING SUBSTANCES



*FIGURE: CFC molecules in the stratosphere destroy ozone molecules in the presence of ultraviolet light. CFC molecules take six to eight years to reach the stratosphere.*

In recent years, many R&D operations target to develop alternative substances and systems that decrease the dependence on ODSs. However, large quantities of ODSs are still used in numerous military and industrial applications until suitable alternatives have been tested, qualified, and implemented. In many applications, such as fire protection and shipboard chilled water air conditioning and refrigeration systems, it may be essential to monitor the ODS concentration in the surrounding air in order to properly manage the ODSs, equipment, or the process.

The GASMET product family includes analysers for both portable use and fixed installations. The analysers offer

- highly reliable identification and quantification of ODSs including CFCs, HCFCs, halons, other chlorinated hydrocarbons, etc
- suitability for continuous operation; the analysers are fully equipped for automated process control applications
- ruggedness; some of the analyser models are sold for military applications; the specification involve harsh vibration and shock testing

## FREONS

Freons are chemical compounds used in aerosols, refrigerant systems, air conditioners, packaging material, and as an electrical cleaning agent. The name "Freon" is a du Pont trademark, and is chemically known as Chlorofluorocarbon (CFC). Various companies sell the same CFCs, HCFCs, and HFCs, under different names.

The advantage of CFC-based chemicals is that they are inert, non-flammable, non-toxic, and non-carcinogenic, and were therefore valued for many years as environmentally safe. Discoveries in the 1970's and 1980's revealed, however, that CFC molecules in the stratosphere destroy ozone molecules in the presence of ultraviolet light.

Freons are referred to as ozone-depleting substances (ODS), along with halons and hydro-CFCs (HCFC). Modern estimates suggest that more than 80% of total stratospheric ozone depletion is caused by CFC emissions to the environment. This information has resulted in a rapid decline in the production of CFC products. Actually, more than 125 nations have signed an international agreement, known as the Montreal Protocol, limiting the ODS production.

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The infrared absorption spectrum of a molecule is characteristic and unique to each molecule. The spectrum is used to "fingerprint" gas samples, producing both qualitative and quantitative data.

The CALCMET algorithm uses library spectra for molecular identification. The computer is able to separate effectively different absorption peaks of the measured sample spectrum. Typically, it does not matter even if the absorption peaks of different compounds are at the same location and overlaying each other: the form of the absorption peak is still characteristic for each molecule. The CALCMET algorithm is able to utilize the information for the specific analysis of different compounds in the sample gas.

The CALCMET algorithm will automatically reject those parts of the infrared spectra, which may be saturated. In other words, the software dynamically adapts itself to the current measuring situation. Consequently, the user will always have the most accurate analysis results available.

1999-06-17 12:22:22		C:\test.spe	
1	Carbon monoxide CO ppm	22.9 ppm	100 0.0009
2	Ethanol C2H5OH	55 ppm	100 0.0009
3	F-11	7.6 ppm	100 0.0009
4	F-113	8.5 ppm	100 0.0009
5	F-114	3.9 ppm	100 0.0009
6	F-116	5.0 ppm	100 0.0009
7	F-12	0.0 ppm	100 0.0009
8	F-122	0.1 ppm	100 0.0009
9	F-123	4.3 ppm	100 0.0009
10	F-134a	0.1 ppm	100 0.0009
11	F-13b1	2.1 ppm	100 0.0009
12	F-14	0.0 ppm	100 0.0009
13	F-141b	0.3 ppm	100 0.0009
14	F-22	0.0 ppm	100 0.0009
15	F-318	2.5 ppm	100 0.0009
16	H2O	0.0 %	100 0.0026
17	Methanol CH3OH	1.8 ppm	100 0.0009

*FIGURE: The patented CALCMET algorithm easily identifies and quantifies different ODSs in complicated gas mixtures. If present in the sample gas, such components like water vapor, ethanol, or methanol are not expected to cause any errors or cross interference effects at all to the analysis results.*

## IR-SPECTRA OF FREONS:

