

# Use of molecular sieve to trap gas

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**Abstract:** The use of molecular sieve to trap trace gasses is discussed in this note.

**Keywords:** Molecular Sieve, Carbosorb, Dessicant trap

**Introduction:** In order to monitor greenhouse gas emissions from farmland, a compound capable of trapping these gases and holding them for extended periods of time is needed. A Molecular sieve can accomplish these goals

Molecular sieve, also know as Molsiv, is a very fine filter capable of trapping molecules on the scale of Carbon dioxide or Nitrous oxide. Smaller molecules are allowed to pass through. The objective of this note is to familiarize any potential user of the requirements to using molsiv in a trapping scenario.

**Issues:** Molsiv is a passive trapping element. It requires no external input to trap gases. However, this means that gas could be collected at unwanted times. Also, acquiring gases in different concentrations is difficult, because they occupy the same locations on the Mol Siv. Other unwanted gases could be trapped. Water, which is always in large concentrations outdoors, does not pass through molsiv.

**Steps:** In order to remove water, a desiccant trap is necessary. These are commercially available and possess large storage capacities. In order to sample Nitrous oxide, carbon dioxide must first be removed. This is typically done using a chemical trap filled with a chemical like carbosorb. While effective, carbosorb is a strong base, and must be handled with care. A chemical resistant case must be used for the chemical trap, and the fittings to the trap must be able to handle the base. The molecular sieve traps must be capable of withstanding high heat, as the process for removing the trace gases

from the molsiv requires high heat. Connectors to the molsiv must also be available, as the extraction process also requires a near vacuum on the molsiv chamber. In addition, to maintain the purity of the sample, quick connect fittings must be available to ensure that the trap is exposed to outside air for as little time as possible.

To solve the problem of differing concentrations, two traps can be used, where the high concentration molecule (Carbon dioxide) is removed from the air entering the low concentration trap. The other trap is unfiltered, and both gases will collect on it. However, in the case of Carbon dioxide and Nitrous oxide, Carbon dioxide is two orders of magnitude more prevalent in air, and so Nitrous oxide on the Molsiv will not affect the results.

Examples: In the case of the automated gas trapping system, a timer and solenoids direct the flow of air into certain traps at certain times. Experiments have been performed to test the ability of molsiv to remove Carbon dioxide and Nitrous oxide from sample volumes. In these tests, the molsiv performed very well, achieving a reduction in concentration of test gasses by two orders of magnitude.

Sources:

Smemo\_et\_al, "An automated trapping system for improved estimates of N<sub>2</sub>O and CO<sub>2</sub> efflux from soil." BERI proposal, 2008.