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News Release: Tech Note

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FAQ: Can MIP see MTBE?

We often get questions about the compound Methyl tert-butyl ether (MTBE, $C_5H_{12}O$) at Geoprobe. Clients believe they should be able to see it, however frequently it won't show up in a response test and they don't know why.

MTBE (Fig. 1) is a highly polar compound, soluble in water, which makes it a difficult compound for lab analysis as well as for MIP. Other compounds which would fall in this class are: Acetone, C_3H_6O ; MEK, C_4H_8O ; MIBK, $C_6H_{12}O$; and Tetrahydrofuran, C_4H_8O . All of these compounds should be handled in the following manner when requested to provide MIP mapping of a plume.

The reason that MTBE would not be visible in a standard response test is that it is removed from the carrier gas by the Nafion dryer. The Nafion dryer is used to remove excess water from the carrier gas stream to protect the GC detectors. The polarity of the MTBE molecule provides the attachment mechanism to water molecules. As the carrier gas passes through the Nafion dryer they are both removed.

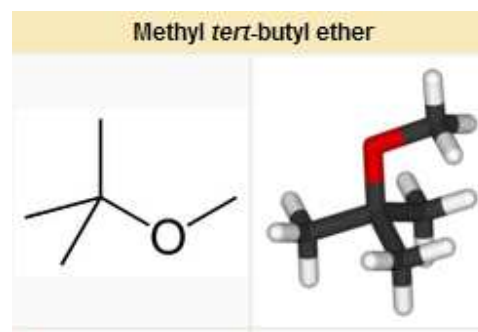


Figure 1: MTBE Structure

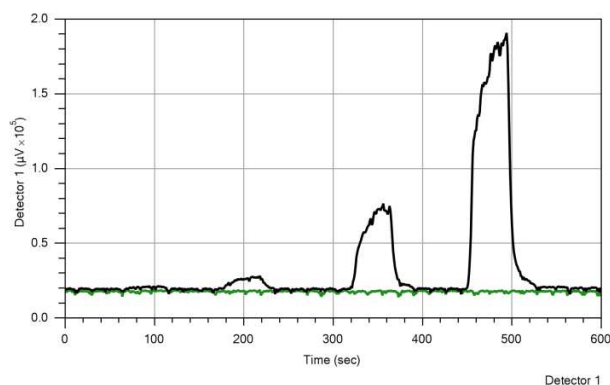


Figure 2: MTBE Response

The response test overlay (Fig.2) includes two response tests of MTBE performed at 1ppm, 5ppm, 25ppm, and 100ppm. The flat green line was MTBE run at these concentrations with the Nafion dryer installed and the black line was the response test with the Nafion dryer removed from the system. Based on these response tests using a new membrane we would recommend a detection limit of about 10ppm would be reasonable and consistently achievable as the membrane wore on a project.

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Other Polar Compounds:

The response test graphs below show the response of Acetone (Fig.3) and Methyl ethyl ketone (MEK) (Fig. 4). Both of these response tests were performed with and without a Nafion dryer installed at standard concentrations of 1ppm, 5ppm, 25ppm, and 100ppm. The flat green lines were with the Nafion dryer installed and the black lines was the response when the Nafion dryer was removed from the system. Since these response tests were performed using a new membrane we would recommend that a consistently achievable detection limit would be about 50ppm for these compounds as the membrane wore during a project.

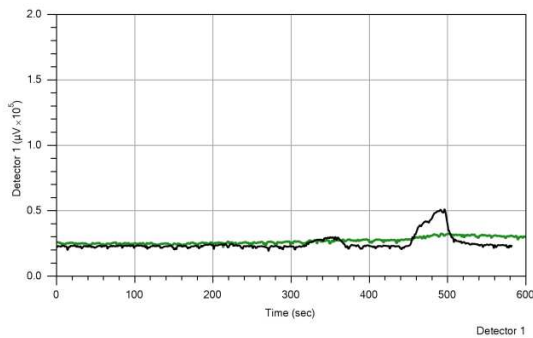


Figure 3: Acetone Response

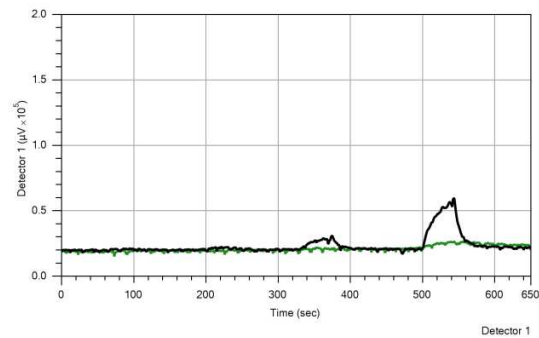


Figure 4: MEK Response

System Setup and Configuration

If the dryer is mounted in the GC oven (See Fig. 5), the return carrier line from the trunkline is connected into the Nafion dryer then into the detectors. In the Fig. 5 setup for MTBE mapping we would remove the carrier line from the dryer and connect directly to the detector tee fitting. If you need to operate an ECD, we would recommend connecting the Nafion dryer after the carrier split just for the line going into the ECD and allowing the carrier gas going to the PID to bypass the Nafion dryer.

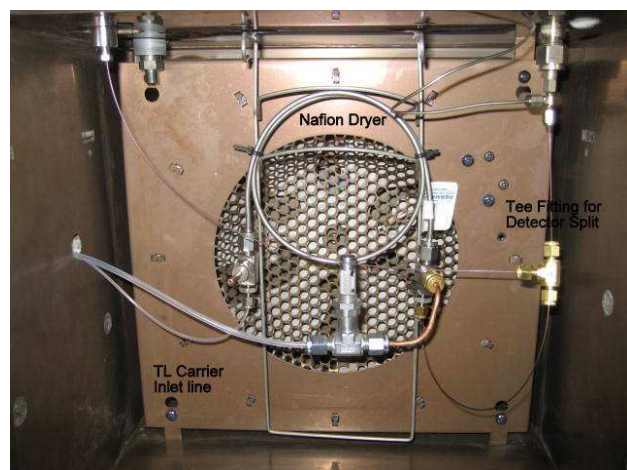


Figure 5: GC & Detector configuration