GC-MS Analysis

Key points

- GC-MS stands for “gas chromatography-mass spectrometry,” and includes two separate tests.
- GC-MS helps to ensure the purity and quality of essential oils.
- GC-MS is a lab analysis to ensure that the specific chemical compounds of an essential oil are representative of that specific oil and that the oil is free of contaminants and adulterants.
- To ensure purity and quality, purchase essential oils from companies that provide this testing.

Ensuring purity and quality

“I just purchased a new bottle of Lavender (Lavandula angustifolia)*…How do I know it is truly* Lavandula angustifolia *and not a different lavender species?”*

Chemical analysis of the lavender oil using two tests, gas chromatography and mass spectrometry (GC-MS), is one method that provides an answer. You would need advanced knowledge and equipment to conduct these tests on your own. Luckily, essential oil distillers and suppliers often use this method to have their oils tested, ensuring the purity and quality of each oil.

Functions of GC-MS

Although we typically cite the two tests together as “GC-MS,” they are separate tests.

The purpose of the first, gas chromatography (GC) is to separate the chemical compounds in the essential oil being analyzed. Do you recall from an earlier lesson that one essential oil is comprised of dozens to hundreds of different chemical compounds? GC works well with essential oils because they are volatile compounds easily changed to gas form without degrading. As the name “gas” implies, this test separates the compounds in gas form.

This test, however, only identifies which chemical compounds are present and the percentage of each. At this point, mass spectrometry (MS) comes into the picture.

When MS is coupled with the GC, it plays the “detective” role. As the separated gas chemical compounds enter the MS detector instrument, each compound is individually sorted according to its mass and then counted. Although this process is very quick, it is fascinating to know that millions of the same chemical compound enter the detector simultaneously. The final analysis is the “fingerprint” known as mass spectrum, and is charted on a graph. This mass spectrum is then compared to databases to identify all of the chemical compounds detected in that particular essential oil.

GC-MS is also used to detect adulteration and contamination by identifying chemical compounds that would not normally be found in a particular essential oil. A “foreign” compound may, for example, be one found in a synthetic fragrance. This typically occurs when manufacturers add fragrance as a filler to produce more essential oil, making production more profitable. There have been reports of essential oils

submitted for third-party GC-MS analysis that are found to contain adulterated essential oils. While this can happen to the best companies at times, repeated occurrence should raise concern.

This analysis can also identify contamination—for example, from accidental contact with another essential oil or with a solvent such as hexane.

Limitations of GC-MS

While GC-MS is a powerful tool, it is not foolproof. In some cases, it can incorrectly identify some chemical compounds. Additional tests with other instruments may be required to further analyze an oil. Remember, essential oils are complex chemical compounds, so this level of rigor in analyzing them is not unusual.

While GC-MS tests are widely used, they are not the only tests available to identify the chemistry, purity, and quality of essential oils. We focused here on GC-MS because it is commonly used and often cited in scientific literature about essential oils.