

Volatile Organic Compounds (VOC's) and Various Test Methods

Volatile organic compounds or VOC's as they are usually called refer literally to organic compounds that are volatile (low boiling point and high vapor pressure compounds). VOC's are environmentally important because they produce smog when they react with nitrogen oxides in photochemical reactions, and they also may have important health implications. EPA regulations are designed to control smog formation by limiting VOC and nitrogen oxide emissions. Certain VOC's have relatively low reactivity with respect to smog formation, and they may be excluded from regulations that limit VOC's in products or in manufacturing. For example, California regulations for consumer products as discussed in method CARB 310 declares that specific compounds may be excluded from the total product VOC content. CARB 310 also provides for exclusion for products or components of products with simulated distillation boiling points above 216 degrees centigrade (the boiling point of dodecane), so called low vapor pressure VOC's or LVP-VOC's. Another twist is for products that have a low vapor pressure--below 0.1 mm at 20 degrees C products require no further VOC testing, irrespective of their chemical composition.

The EPA lists a number of compounds that have negligible smog producing activity. Typically these are highly fluorinated compounds or siloxanes but the list also includes methane, ethane, methyl acetate, and acetone to name a few.

There are a number of methods for determining VOC content of products or specific VOC compounds and excluded compounds. These methods either involve a direct determination of the VOC compounds via gas chromatography, or they rely upon indirect determinations that require several analytical steps. For example, the CARB 310 method and EPA 24 method both rely on indirect determination of the VOC's and require several steps. The total volatile content is first determined by heating the sample under specified conditions to drive off all volatile compounds. Then permitted or excluded compounds are determined directly and subtracted from the total to come up with a net VOC for reporting purposes. Like all methods, these are not perfect, and can be problematic in certain cases.

Other approaches for VOC analysis are more direct and determine permitted and VOC compounds directly, such as ASTM D 6886 method. Products such as water based paint where the VOC's are often limited to handful of compounds and the water content is high can be evaluated by the direct analysis with good success. This latter approach is taken by Greenseal (www.greenseal.org) in their quest to support green products. If the product is complex such as an emulsion, it is possible that a direct approach would not work very well and would require expenditure of considerable time and resources to determine all the VOC's.

If you have any questions regarding VOC's or VOC testing, please give us a call and we will do our best to provide you guidance on VOC's and their testing.