Fact Sheet: Method 1664, Oil and Grease, Revision A

Fact Sheet; February 1999

EPA announces publication of a final rule approving use of EPA Methods 1664, Revision A, and 9071B for determination of oil and grease and non-polar material (NPM) in EPA's wastewater program (40 CFR part 136) and hazardous waste program (40 CFR part 260). Approval of these methods supports EPA's effort to protect Earth's ozone layer by reducing dependency on use of chlorofluorocarbons (CFCs). Methods 1664 and 9071B employ n-hexane as the extraction solvent in place of 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113), a Class 1 CFC.

Background

The U.S. Environmental Protection Agency (EPA) publishes analytical testing methods that are used by industrial and municipal facilities to analyze chemical and biological components of wastewater, drinking water, sediment, and other environmental samples (for the purpose of data gathering and compliance monitoring under the Clean Water Act and the Safe Drinking Water Act.)

EPA is approving Method 1664, Revision A, for use under the Clean Water Act and as an additional analytical method for the determination of oil and grease and non-polar material in aqueous matrices in EPA's wastewater and hazardous waste programs. EPA *Method 1664, Revision A: N-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM; Non-polar Material) by Extraction and Gravimetry* is being approved as part of EPA's effort to reduce dependency on use of chlorofluorocarbons (CFCs). EPA is also approving Method 9071B for use in the hazardous waste program for solid and semi-solid materials.

Method 1664, Revision A

Method 1664, Revision A, is a liquid/liquid extraction (LLE), gravimetric procedure that employs normal hexane (*n*-hexane) as the extraction solvent, in place of 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113; Freon-113), a Class 1 CFC, for determination of the conventional pollutant oil and grease. Because the nature and amount of material determined is defined by the solvent and by the details of the method used for extraction, oil and grease and NPM are "method-defined analytes."

Method 1664, Revision A is capable of measuring HEM and NPM in the range of 5 to 1000 mg/L, and may be extended to higher levels by analysis of a smaller sample volume collected separately. The method detection limit (MDL) for HEM in Method 1664, Revision A is 1.4 mg/L and the minimum level of quantitation (ML) is 5.0 mg/L.

Method 1664, Revision A may be modified to reduce interferences and take advantage of advances in technology or to lower the costs of measurements, provided that all method equivalency and performance criteria are met. This performance-based approach is consistent with the Agency's streamlining proposal and the Agency's performance-based measurement system policy.

Improvements and Changes Included in Revision A of Method 1664

Revision A to Method 1664 is based on comments and analytical data received during both comment periods for the proposed rule (61 FR 1730; January 23, 1996 and 61 FR 26149; May 24, 1996) and the comment period for the notice of data availability (62 FR 51621; October 2, 1997). The significant improvements include: (1) the term "total petroleum hydrocarbons" (TPH) has been replaced by "non-polar material" (NPM) to avoid confusion with TPH measurements by other methods; (2) the requirement for a matrix spike duplicate (MSD) has been changed to a suggestion; (3) the size of an analytical batch has been increased to a maximum of 20 samples per discharge or waste stream; and (4) use of solid-phase extraction (SPE) has been allowed without a demonstration of equivalency, provided that the discharger/generator assumes the risk associated with any disparity in results from liquid-liquid extraction (LLE).

Timing of Required Use of Method 1664, Revision A and Phaseout of Use of CFC-113

EPA proposed to withdraw the currently approved methods six months after publication of the final rule in the Federal Register in an effort to provide for use and depletion of existing laboratory stocks of CFC-113. EPA has decided not to withdraw the CFC-113 based on commenters' concerns about potentially differing results using the new method that could bring a permittee into noncompliance under certain circumstances. However, EPA believes that direct replacement of the new method is warranted in most cases. Therefore, EPA strongly encourages dischargers/permittees to use Method 1664 rather than the CFC-113 methods for existing permits. EPA also recommends the use of the new method for all new permits and reissued permits.

Method 9071B

EPA is also approving the use of Method 9071B for use in EPA's hazardous waste program. This method is for solid and semi-solid materials. Method 9071B also uses n-hexane instead of CFC-113 as the extraction solvent. This method is not required by any hazardous waste program regulation but it can be included as part of a hazardous waste delisting demonstration.

Additional Information and Copies

For more information concerning the final rule approving use of Method 1664, Revision A, please contact EPA's Office of Water (4303T), USEPA Office of Science and Technology, 1200 Pennsylvania Ave NW, Washington, DC 20460, For information regarding the use of Method 1664, Revision A in the Office of Solid Waste, contact the Office of Solid Waste (5307W), USEPA, 1200 Pennsylvania Ave NW, Washington, DC 20460. The final rule published in the *Federal Register* contains instructions on how to obtain additional information and how to review the public record for this rulemaking.

Final method—Revision A | Print version (PDF) (160 K, 28 pages)

Covalent bond = a bond in which the electrons are shared by the partner atoms.

Polar bond = simply a type of covalent bond in which the electrons are shared but not equally. This happens when two different atoms come together, such a C and O. Each atom has a different ability to draw electrons to itself when it shares electrons (that drawing ability is called *Electronegativity*).

Polar covalent bond = same as a "polar bond".

Nonpolar bond = two of the same atoms come together, such as the diatomic molecule N_2, or triatomics such as O_3, etc. A nonpolar covalent bond could be viewed as having "pure" covalent character. There is perfectly equal sharing.

Polar molecule = a molecule in which the polar bonds are disposed in such a way that it imparts an asymmetry to the molecule as a whole. That is, it gives the whole molecule a *Dipole Moment*:

example: water H-O-H has two polar bonds. Since this molecule is Bent, those two polar bonds ADD TOGETHER to produce a molecule with a dipole moment. That is, a polar molecule.

example: carbon dioxide O=C=O has two polar bonds also. Since this molecule is Linear, those two polar bonds ADD TOGETHER to cancel each other out, to produce a molecule with NO dipole moment. That is, a nonpolar molecule.

example: carbon tetrachloride CCl_4 has four very polar bonds but these bonds are pointing to the corners of a tetrahedron, and form a very symmetric arrangement. The polarity cancels itself out, and the molecule is NONPOLAR.

To determine whether a molecule is polar or not,

1. First look at each chemical bond in the molecule and determine whether it is a polar bond or not. A bond will be polar any time the two atoms in the bond have different electronegativities. This happens essentially any time the two atoms are different. For example, C-0 is polar C-C is not. However, consider a C-H bond as essentially nonpolar, since the EN's are so close to each other.

2. Represent each polar bond as a vector in space, radiating out from the central atom.

3. Add the vectors together mentally. IF the symmetry of the molecule causes these vectors to add to get a zero vector, you will end up with a NONPOLAR molecule.

e.g. O=C=O is linear, with two polar bonds <---C---> pointing in opposite directions. The molecule is NONPOLAR.

```
       S
e.g.   / \    H2S is polar, since the two vectors add to get a net dipole vector.
      H   H
```

4. Consider pure hydrocarbons to be essentially nonpolar since they are made up of basically nonpolar C-H bonds.