Vapor Intrusion Assessments for Concrete Subslabs

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**MASS FLUX CHAMBER EXPERIMENTAL SETUP**

**HOW IT WORKS**

1. Liquid heptane is loaded into the bottom chamber. Heptane mass is measured before and after the experiment using a digital scale.
2. Over time, the heptane volatilizes into a gas and diffuses through the pores and void spaces of the concrete sample. The concrete sample is surrounded by heat shrink tubing to prevent gas from circumventing the sample and seals the flux chamber together.
3. A constant flowrate of air is pumped through the top chamber inlet port to clear the heptane gas, providing a constant mass transfer driving force.
4. Outlet gas is collected periodically in a Tedlar® bag and heptane concentration is sampled using a Photoionization detector (PID). Heptane concentration is sampled in the bottom chamber using gas-tight syringes through the septum.

**MATIERIALS OF CONSTRUCTION**

**Concrete**

- **Trichloroethylene (TCE)**
  - **Primary Uses**
    - Industrial Solvent
    - Degreaser
    - Common ingredient in adhesives, paint removers, carpet cleaner
  - **Regulations**
    - OSHA Regulatory Standard for Industrial sites is 100 ppm for 8-hour exposure (permissible exposure limit)
  - **Heptane (Experimental Substitute)**
    - Non-toxic VOC
    - Similar molecular weight and vapor pressure to TCE
    - Easily detected using PID and GC/MS

**Volatile Organic Compounds**

<table>
<thead>
<tr>
<th>Compound</th>
<th>Molecular Weight (g/mol)</th>
<th>Vapor Pressure at 25°C (kPa)</th>
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<tbody>
<tr>
<td>TCE</td>
<td>113.4</td>
<td>9.97</td>
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<tr>
<td>Heptane</td>
<td>100.2</td>
<td>5.33</td>
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</tbody>
</table>

**Heat Shrink Tubing**

- Fluorinated ethylene propylene
- Shrinks from 3.1” to 2.7”
- Shrinks at temperatures above 215°C
- Selected for impermeability, use with non-uniform sample walls

**Future Work**

- Investigate the effects of varying surface area by introducing impermeable materials to the top of the concrete.
- Develop passive sampling device for vapor intrusion.

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**References**