Polycyclic Aromatic Hydrocarbons on the Kalamazoo River Shoreline Following the 2010 Enbridge Oil Spill

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Abstract

• One of the nation’s worst inland oil spills occurred near Marshall in Michigan in 2010.
• The recent Enbridge Line 6B rupture released over three million liters of diluted bitumen crude oil into the environment.
• The spilled oil entered the Talmadge Creek and flowed into the Kalamazoo River, a Lake Michigan tributary.
• Polycyclic Aromatic Hydrocarbons (PAHs) together with other pollutants were released into the environment.

Introduction

Soil samples were taken from locations on the Kalamazoo river bank, previously inundated with oil during the oil spill and now exposed due to lower water level.

Five years following the Kalamazoo River oil spill accident, an environmental investigation was conducted on the oil spill-affected area.

PAH Structures

<table>
<thead>
<tr>
<th>PAH Structure</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo(a)pyrene</td>
<td>C20H12</td>
</tr>
<tr>
<td>Benzo(b)fluoranthene</td>
<td>C20H12</td>
</tr>
<tr>
<td>Benzo(g,h,i)perylene</td>
<td>C20H12</td>
</tr>
<tr>
<td>Chrysene</td>
<td>C20H12</td>
</tr>
<tr>
<td>Fluorene</td>
<td>C12H10</td>
</tr>
<tr>
<td>Fluoranthene</td>
<td>C18H12</td>
</tr>
<tr>
<td>Anthracene</td>
<td>C14H10</td>
</tr>
<tr>
<td>Acenaphthene</td>
<td>C14H10</td>
</tr>
<tr>
<td>Indeno[1,2,3-cd]pyrene</td>
<td>C34H20</td>
</tr>
</tbody>
</table>
| Chibwe, L.; Geier, M. C.; Nakamura, J.; Tanguay, R. L.; Aitken, M. D.; Simonich, S. L. M.

Conclusions

• Five years following the Kalamazoo River oil spill accident, an environmental investigation was conducted on the oil spill-affected area.
• Six shoreline locations along the Kalamazoo river oil spill affected area were investigated using GC-MS to determine the level of PAHs.
• The oil spill rupture site has the highest PAH concentrations while upstream and down stream river sites have relatively low PAHs concentrations.
• The top layer of the accident site has double total PAHs concentration of the deeper layer.
• Pyrene, chrysene, fluoranthene, benzo(a)pyrene, and phenanthrene are dominant PAHs in the upper and lower layers of the accident site.
• Further cleanup of the accident site is recommended.

Literature Cited

6. The map was produced by Matthew Borr, Geography Department, Western Michigan University.