



Huntington Beach Oil Spill Analysis Using Solid-Phase Microextraction Gas Chromatography-Mass Spectrometry (SPME-GC-MS)

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On October 2, 2021, a pipeline connecting Long Beach and Elly drilling platform burst resulting in ~140,000 gallons of crude oil leaking into the ocean, beach sand, and wetlands.



Huntington Beach



Huntington Beach Talbert Marsh

Solid phase microextraction (SPME) was combined with gas chromatography-mass spectrometry (GC-MS) and time-of-flight mass spectrometry (GC-TOF/MS) to determine how



HANDS IN THE SAND

hydrocarbon compounds in the Huntington Beach and Talbert Marsh sand change in a year.

Sample Preparation



SPME Fiber: DVB/PDS



GC-MS

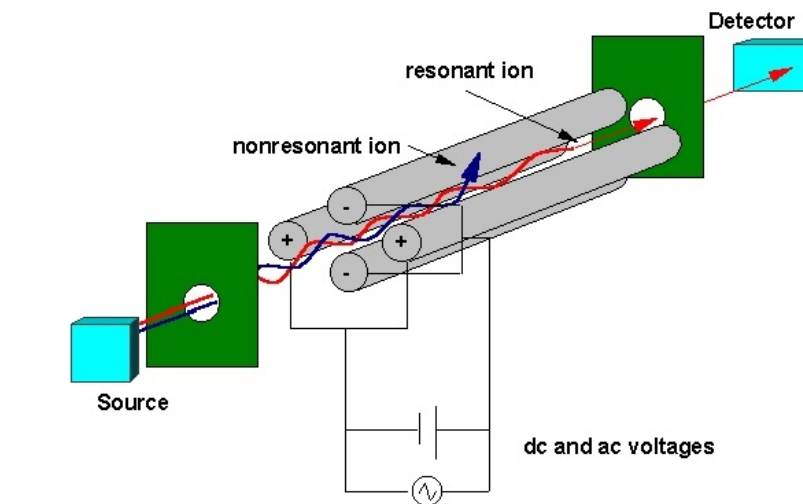


VS

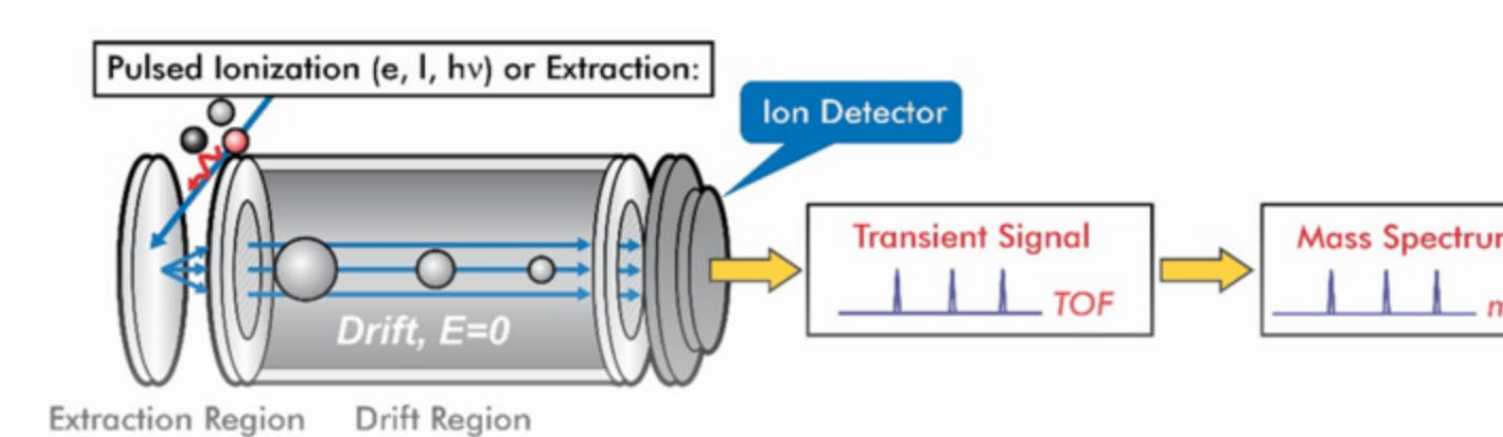
GC-TOF/MS



MS: Agilent 5977B



TOF/MS: LECO Pegasus BT



Agilent MSD Productivity ChemStation



LECO ChromaTOF

- 2 g dried in 20 mL glass vial
- Incubate: 5 mins at 80 °C

- Precondition: 5 mins at 250 °C
- Extraction: 10 mins in incubator

- Oven: 40 °C to 300 °C at a ramp of 20 °C/min

Results

Month	GC-TOF/MS					
	Outer 1	Outer 2	Outer 3	Inner 1	Inner 2	Inner 3
Jan.	Tridecane	Copaene Cyclopentane Ethylbenzene Fluorene Naphthalene Phenanthrene Pyrene Styrene Toluene	Ethylbenzene Fluoranthene Pyrene Styrene Toluene	Azulene Diphenylmethane Phenanthrene Pyrene Toluene	Azulene Diphenylmethane Ethylbenzene Fluoranthene Fluorene Phenanthrene Styrene Toluene	Ethylbenzene Pyrene Styrene Toluene
May	Azulene Cetene Ethylbenzene Phenanthrene Pyrene Styrene Toluene	Cetene Ethylbenzene Henicosane Styrene Toluene	Alloaromadendrene Benzene Camphene Pregnane Copaene Ethylbenzene Phenanthrene Styrene Ylangene	Azulene Ethylbenzene Pregnane Styrene Toluene	Ethylbenzene Fluoranthene Mesitylene Phenanthrene Styrene Toluene	Ethylbenzene Fluoranthene Phenanthrene Pyrene Styrene Toluene
Oct.	Phenanthrene Styrene Toulene	Cetene Ethylbenzene Styrene Toluene	Azulene Benzene Ethylbenzene Pyrene Styrene	Anthracene Benzene Ethylbenzene Mesitylene Naphthalene Phenanthrene Pyrene Styrene Toluene	Benzene Ethylbenzene Isopropylcyclobutane Phenanthrene Pyrene Styrene Toluene	Ethylbenzene Mesitylene Pregnane Styrene Toluene

- Biodegradation: occurs through the oxidation of hydrocarbons; aldehyde and carboxylic acid products

Month	GC-MS					
	Outer 1	Outer 2	Outer 3	Inner 1	Inner 2	Inner 3
Jan.	-	Pentadecane	Dodecane Tridecane Tetradecane	-	Eicosane	Naphthalene Pentadecane
May	Tridecane Pentadecane Hexadecane Heptadecane	Caryophyllene Pentadecane	Aromandendrene Pentadecane Heptadecane	Pentadecane Heptadecane	Tetradecane Aromandendrene Pentadecane Hexadecane Heptadecane	Pentadecane Heptadecane
Oct.	-	-	-	-	-	-

- Aromatic compounds detected with GC-TOF/MS

Acknowledgement to

CSU COAST (award no. COAST-RR-2021-03)

Conclusions

- Rapid biodegradation
- GC-TOF/MS detected higher toxicity compounds
- NEXT: Biodegradation and concentrations of compounds



References

Figures from left to right, top to bottom:
<https://huntingtonbeachca.gov>, <http://scwrp.org>
<https://calstate.edu>, <https://palsystem.com>,
<https://agilent.com>, <https://lab-training.com>,
<https://chem.libretexts.org>, <https://equipnet.com>,
<https://theanalyticalscientist.com>