Development of an expedited field study method for PCBs and dioxins in sediments and soils using portable GC/MS



Speaker: Mengliang Zhang Advisor: Dr. Glen P. Jackson

Department of Chemistry and Biochemistry, Ohio University



Biphenyls (PCBs) Polychlorinated dibenzo-p-dioxins (PCDDs)

Polychlorinated dibenzofurans (PCDFs)



12 of 209 WHO Concern

Cl_n Cl_m

7 WHO Concern

Cln Clm

10 WHO Concern

Introduction - PCBs

Polychlorinated biphenyls



STABLE

Oxidation Reduction Addition Elimination Electrophilic Substitution

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Low reactivity Non-flammable High electrical resistance Stable exposed to heat & pressure

OXICITY	7
Carcinogenesis	
Hepatotoxicity	
Chloracne	
Otitis media	
Reduced Neurodevelopment	(

Used as lubricants, coolants and insulators in industry
Extremely difficult to decompose

Bioaccumulation

Introduction - PCBs

First manufactured in 1929 by Monsanto Use banned in US in 1979 A congener is a specific conformational isomer (arrangement) of C_xH_yCl_z An Aroclor is a commercial name for mix of multiple congeners

	Names related to PCBs							
	PCB congeners	Aroclor	Other trade names					
	209	Aroclor – 1016 Aroclor – 1242 Aroclor – 1260 Aroclor – 1221 Aroclor – 1248	Chlorextol Pyṛanol/Pyrenol Askarel					
Number of C Aroclor 12	Percentage of CI	Aroclor – 1268 Aroclor – 1232 Aroclor – 1254						

Introduction - SPME

SPME -- Solid Phase Micro xtraction



Introduction – GC-TMS

GAS CHROMATOGRAPHY-TOROIDAL ION TRAP MASS SPECTROMETER





(Torion Technologies, American Fork, Utah, USA)

Introduction – Aroclor Determination

Conconor	IUPAC	Aroclor							
Congener	Number	1016	1221	1232	1242	1248	1254	1260	
Biphenyl			Х						
2-CB	1	Х	Х	Х	Х				
2,3-DCB	5	Х	Х	Х	Х	Х			
3,4-DCB	12	Х		Х	Х	Х			
2,4,4'-TCB	28	Х		Х	Х	Х	Х		
2,2',3,5'-TCB	44			Х	Х	Х	Х	Х	
2,3',4,4'-TCB	66					Х	Х	Х	
2,3,3',4',6-PCB	110						Х		
2,3',4,4',5-PCB	118						Х	Х	
2,2',4,4',5,5'-HCB	153							Х	
2,2',3,4,4',5'-HCB	138							Х	
2,2',3,4,4',5,5'-HpCB	180							Х	
2,2',3,3',4,4',5-HpCB	170							Х	
EPA method 8082 3~5 peaks include at least 1 peak unique for that Aroclor									



base on extractio fine Paired t test results show significant difference





Calibration curves using peak area (blue) and peak height (red) for PCB 66, PCB 153, PCB 138, and PCB 180 in Aroclor 1260 solutions.





Comparison of TIC of Aroclor 1260 (red, 7500 ng in 10 mL vial) and 8082A (blue, 500 ng in 10 mL vial) standard solutions on the portable GC-TMS.





TIC of Aroclor 1260 standard solutions (100 ppm) with different amounts using portable GC-TMS.



 SPME-GC-TMS performance on determination of PCBs in soil samples

Method validation

Field analysis of PCBs in soil samples

Method development for dioxins

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