



UNIVERSITY OF UMEÅ
Department of Organic Chemistry

July 19, 1982

Geraldine Sanderson
Manager, ACS News Service
1155 16th Street, N.W.
WASHINGTON, D.C. 20036 U S A

Dear Dr. Sanderson,

Enclosed please find a press release for my presentation

POLYCHLORINATED DIOXINS, DIBENZOFURANS AND OTHER POLYNUCLEAR AROMATICS
FORMED DURING INCINERATION AND PCB FIRES

for the 184th ACS National Meeting in Kansas City. The place of presentation as well as my Kansas City address is unknown to me. I am leaving Sweden August 16. If you would like to forward some information to me, please contact Dr. Gangadhar Choudhary, NIOSH, one of my co-organizer to this symposium, his address is:

Dr. Gangadhar Choudhary
NIOSH
DPSE, Mail Stop R-3
4676 Columbia Parkway
CINCINNATI, OHIO 45226

Dr. Choudhary is also organizing for my lodging in Kansas City.

Until August 2 you can reach me at telephone 46-290-550 31

August 2-16

46-90-16 52 66 or 46-90-13 44 80 (home)

Sincerely yours,

Christoffer Rappe

Christoffer Rappe, professor

NEV 036504

CR,ul

P.S. I am on vacation and
this letter had disappeared
for 2 weeks on it's way from
me to my secretary



SEP 1982

American Chemical Society

ACS NEWS SERVICE

1155 SIXTEENTH STREET, N.W.

WASHINGTON, D.C. 20036

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DIVISION Environmental

PAPER # 37 / 2⁰⁵pm Tues

AMERICAN CHEMICAL SOCIETY'S 184TH NATIONAL MEETING

KANSAS CITY, MISSOURI

SEPTEMBER 12-17, 1982

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KANSAS CITY ADDRESS DURING MEETING _____
KANSAS CITY PHONE NUMBER _____
ARRIVAL DATE IN KANSAS CITY Sept 13
DEPARTURE DATE FROM KANSAS CITY Sept 16

THIS DOCUMENT IS (Circle One):

1. Paper 2. Summary 3. News Release 4. Other (Specify)

TIME & DATE OF PRESENTATION 205 am/pm Sept. 12, 13, (14), 15, 16, 17
(Indicate hour) (Circle Date)

PLACE OF PRESENTATION Convention Center ROOM # 205 East
Lobby Level

(Note to Correspondents: Release time is the time of presentation)

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NEW

POLYCHLORINATED DIOXINS, DIBENZOFURANS AND OTHER POLYNUCLEAR
AROMATICS FORMED DURING INCINERATION AND PCB FIRES

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The occurrence of polychlorinated dioxins (PCDDs) and dibenzofurans (PCDFs) in fly ash is well documented. There is much less data reported on levels in other incineration products like flue gas and particulate.

Due to the extreme toxicity of some of the PCDD and PCDF isomers and the large variation in toxicity and biological potency between closely related isomers, a risk evaluation should be based on the levels of the highly toxic isomers. However, isomer specific analyses have only been made in a few cases, in most studies the results have been given in terms of tetra-CDDs, tetra-CDFs, hexa-CDDs etc. The number of isomers in this type of samples is quite large, more than 30 PCDDs and 60 PCDFs have been found.

RESULTS

Municipal incineration, fluidized bed (Sweden)

We have investigated a municipal incinerator working with a fluidized bed. The samples analyzed were extracts of particulates and condensates taken at two different sampling occasions. We found:

1. large variation between the two sampling occasions depending on the conditions in the fluidized bed (temperature, retention time, oxygen excess)
2. higher levels in the condensate than in the particulates indicating that the major source of PCDDs and PCDFs is the flue gas
3. a marked predominance for the tetra-, penta- and hexa-CDFs over the corresponding PCDDs
4. a dominance of octa-CDD over octa-CDF
5. tetra-CDFs is the dominating chlorination level among the PCDDs
6. octa-CDDs is the dominating chlorination level among the PCDFs
7. tetra-CDDs (and 2,3,7,8-tetra-CDD) could only be found in one of the four samples, a condensate. The level of 2,3,7,8-tetra-CDD is about 0.3 ng/m³.
8. a large number of tetra-CDF isomers could be identified
9. in addition to PCDDs and PCDFs we could find other polychlorinated polynuclear aromatics (like chloropyrenes, chlorochrysenes and chlorobenzopyrenes) in these samples. The biological effects of these compounds have not been investigated.

Industrial boiler (USA) - PCP incineration

Samples of bottom ash and baghouse ash from an industrial boiler burning pentachlorophenol (PCP) contaminated waste were analyzed. A multitude of PCDDs and PCDFs were identified and the total levels of PCDDs were about 5 ppm and of PCDFs about 2.5 ppm. In this case 2,3,7,8-tetra-CDD is only a very minor peak and more than 90% of the PCDDs are lower chlorinated congeners than octa-CDD, the expected PCP-dimerization product. The pattern of the tetra-, penta and hexachloro dioxins is in good agreement with the dioxin pattern found in samples of European fly-ash.

Rotatory cement kiln (Norway) - PCB incineration

We have analyzed a series of samples taken during a test study of thermal destruction of PCB in a rotatory cement kiln in Norway. The kiln is 150 m long with a diameter of 3.5 m. It has a so called "wet" oven operating at 1450 °C in the solid material and at 2000 °C in the flames. During the test period 4 m³ of PCB was burned at a feeding rate of 50 kg/h. The samples analyzed include condensates, particulates and cement. All the samples were negative for PCDFs and PCDDs.

Accidental PCB-fires

a) Capacitor fire, Skövde, Sweden

In March 1982 a fire broke out in a capacitor battery (400 V) serving a high-frequency oven. The dielectricum in the capacitors consisted of mineral oil or PCB and the two types of capacitors were

containing mineral
completely extinguished.

Wipe tests were
exceeding 100 ng/m²
The highly toxic
isomers.

series of poly-
es could be found

-fire in Stockholm,
in PCB was ignited
extract contain-
was analyzed
phenylenes, but
1-tetra- and

re of 65%
from this fire
PCDFs, more than
and for penta-
re highly toxic

, the dominating

isomers were the highly toxic 2,3,7,8-tetra-CDD (0.6 ppm) and 1,2,3,7,8-penta-CDD (2.5 ppm).

CONCLUSIONS

In addition to polychlorinated dioxins and dibenzofurans, we have found several other products like polychlorinated biphenylenes, pyrenes, benzopyrenes and chrysenes.

Much interest has been given the observation of polychlorinated dioxins in incineration products. It has been suggested by Dow Chemicals that dioxins are ubiquitous and formed in de novo reactions. The data reported here shows a much more complicated picture.

1. The dioxins are only one part of the problem of the formation of toxic polychlorinated polynuclear aromatics (PCPNAs) during incineration and other thermal reactions. The same interest should be given to the polychlorinated dibenzofurans.
2. The highest levels of PCPNAs are found when technical products are thermally converted directly into dioxins or dibenzofurans. Examples of precursors are:
chlorophenols - dioxins
PCBs - dibenzofurans, biphenylenes
chlorobenzenes - dioxins, dibenzofurans
chlorodiphenyl ethers - dioxins, dibenzofurans
3. Dechlorination of octachlorodioxin to hepta-, hexa- and other lower chlorinated dioxins is another major pathway.
4. Lower chlorinated compounds like mono-, di- and trichloro derivatives of dioxins, dibenzofurans, pyrenes, benzopyrenes and

chrysenes can be formed in a de novo formation similar to the formation of benzo(a)pyrene and other polynuclear aromatics in most incineration reactions.

5. Under special conditions flue gas is the major source of PCPNAs.