



The EUROSTARS CHLOFFIN Project, new standards for the quantification of chlorinated paraffins

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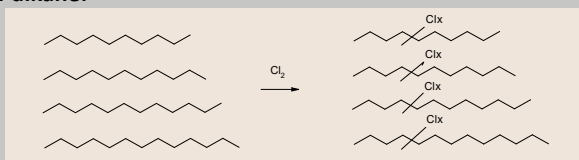


Introduction:

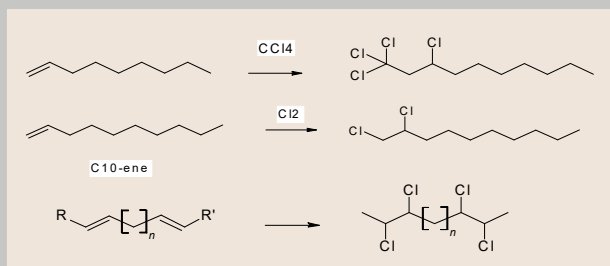
- **CHLOFFIN** project (oct.2019 - oct.2022) is a collaboration between Chiron AS, the EU commission (the Joint Research Center JRC, Geel) and the Free University of Amsterdam.
- **The ultimate aim** is to develop a set of clearly defined reference materials for Chlorinated Paraffins (CPs) for quantification.
- **CPs are highly toxic** to mammals via bioaccumulation and potential carcinogenic to humans. Short-chain CPs (SCCPs) have been prohibited in the EU since 2012. CPs represent a category of POPs that needs to be monitored, but no suitable and generally accepted reference standards are commercially available yet.
- **Chiron offers a broad range of CPs** and with CHLOFFIN project to develop a synthetic mixture of well-defined CPs single isomers as reference materials.

Materials and Methods:

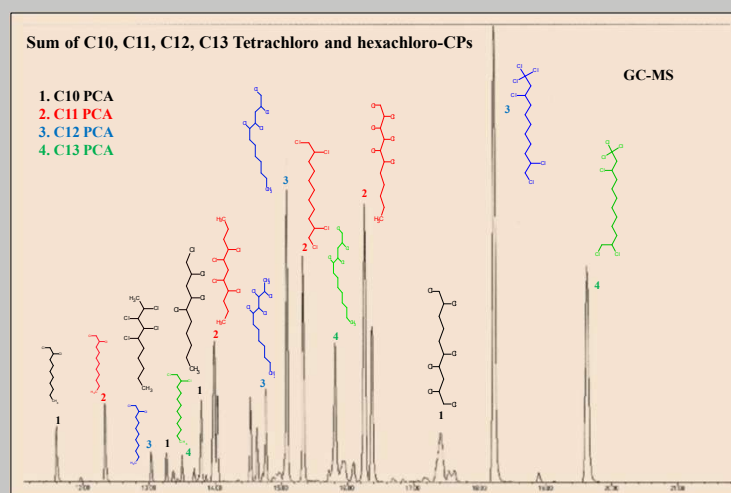
- CPs mixtures are produced in industry by direct chlorination of n-alkane:



- Chiron synthesis of single CPs isomers with defined chlorine contents:



- Prepare a synthetic mixture of well-defined CPs isomers as a reference material:



Results and Discussions:

- **CHLOFFIN** will develop **CPs standards with defined composition** and response factors similar to the industrial mixture.
- The CPs standards are **single molecule compounds**, which are useful in the quantification and as standards for CP determination.
- The CPs standards will be divided into the **various classes** according to carbon length and chlorine content.
- **¹³C-labelled CPs** will be developed in CHLOFFIN project as internal standards for CPs quantification.

Current "toolbox" of SCCPs at Chiron:

| C10-C13 CPs (SCCPs): | | | |
|----------------------|---|-----------------|---|
| 1666.10-100-IO | 1,2-Dichlorododecane | 1668.12-100-IO | 1,2-Dichlorododecane |
| 1662.10-100-IO | 1,1,1,3-Tetrachlorododecane | 1663.12-100-IO | 1,12-Dichlorododecane |
| 13255.10-100-IO | 1,2,4,5-Tetrachlorododecane, isomermix | 1651.12-100-IO | 1,1,1,3-Tetrachlorododecane |
| 1671.10-100-IO | 1,2,9,10-Tetrachlorododecane | 13398.12-100-IO | 1,2,4,5-Tetrachlorododecane |
| 12590.10-100-IO | 2,3,4,5-Tetrachlorododecane, isomermix | 1675.12-100-IO | 1,2,11,12-Tetrachlorododecane |
| 1659.10-100-IO | 1,1,1,3,9,10-Hexachlorododecane | 12425.12-100-IO | 2,3,4,5-Tetrachlorododecane |
| 12284.10-100-IO | 1,2,5,6,9,10-Hexachlorododecane | 1652.12-100-IO | 1,1,1,3,11,12-Hexachlorododecane |
| 1622.10-100-IO | 1,1,1,3,8,10,10,10-Octachlorododecane | 1624.12-100-IO | 1,1,1,3,10,12,12,12-Octachlorododecane |
| 1667.11-100-IO | 1,2-Dichloroundecane | 1669.13-100-IO | 1,2-Dichlorotridecane |
| 1649.11-100-IO | 1,1,1,3-Tetrachloroundecane | 1653.13-100-IO | 1,1,1,3-Tetrachlorotridecane |
| 13397.11-100-IO | 1,2,4,5-Tetrachloroundecane | 13399.13-100-IO | 1,2,4,5-Tetrachlorotridecane |
| 1674.11-100-IO | 1,2,10,11-Tetrachloroundecane | 1654.13-100-IO | 1,1,1,3,12,13-Hexachlorotridecane |
| 12728.11-100-IO | 4,5,7,8-Tetrachloroundecane | 12428.13 | 2,3,4,5,6,7-Hexachlorotridecane |
| 12285.11-100-IO | 1,2,3,4,5,6-Hexachloroundecane, isomermix | 1625.13-100-IO | 1,1,1,3,11,13,13,13-Octachlorotridecane |
| 1650.11-100-IO | 1,1,1,3,10,11-Hexachloroundecane | | |
| 1650.11-100-AC | 1,1,1,3,10,11-Hexachloroundecane | | |
| 1623.11-100-IO | 1,1,1,3,9,11,11,11-Octachloroundecane | | |

C10-C13 synthetic CP mixtures: **S-5131 with 49.0% chlorine similar as Hordalub 17**

| SCCPs, C10-C13 Mixes | | % C10 | % C11 | % C12 | % C13 | % Cl | Conc. | No. comp. |
|----------------------|--|-------|-------|-------|-------|-------|-------------------|-----------|
| S-5131, CP Mix 09 | C10-13 SCCPs Mix 49.0 % Cl ("Hordalub 17") | 10 | 33 | 40 | 17 | 48.98 | 50 µg/mL in total | 15 |
| S-5132, CP Mix 10 | C10-13 SCCPs Mix, 51.5 % Cl ("SCCP 51.5%") | 10 | 33 | 40 | 17 | 51.50 | 50 µg/mL in total | 15 |
| S-5133, CP Mix 11 | C10-13 SCCPs Mix, 56.0 % Cl ("Hordalub 80") | 10 | 33 | 40 | 17 | 56.01 | 50 µg/mL in total | 13 |
| S-5134, CP Mix 12 | C10-13 SCCPs Mix, 60.0 % Cl ("Cereclor 60") | 10 | 33 | 40 | 17 | 60.00 | 50 µg/mL in total | 13 |
| S-5135, CP Mix 13 | C10-13 SCCPs Mix, 62.3 % Cl ("Hordalub 500") | 10 | 33 | 40 | 17 | 62.31 | 50 µg/mL in total | 9 |
| S-5136, CP Mix 14 | C10-13 SCCPs Mix, 64.7 % Cl ("Cereclor 70") | 10 | 33 | 40 | 17 | 64.71 | 50 µg/mL in total | 4 |



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Available CPs Toolbox at Chiron - Phone: +47 73 87 44 90 Fax: +47 73 87 44 99 Website: www.chiron.no

