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(H)(C)FC and HFO Nomenclature - basic principles

CFCs, HCFCs, HFCs, HCs and PFCs

In the identification of fluorocarbons, use is made of prefixes and sets of numbers and/or letters. Prefixes typically consist of the letters H, C, F and C, whereby "H" stands for hydrogen, the first "C" for chlorine, "F" for fluor and the final "C" for carbon:

Prefix	Chemical class	Atoms present in the molecule	Example
CFC	chlorofluorocarbon	Cl, F, C	CFC-111
HCFC	hydrochlorofluorocarbon	H, Cl, F, C	HCFC-142b
HFC	hydrofluorocarbon	H, F, C	HFC-143a
HC	hydrocarbon	H, C	HC-170
PFC	Perfluorocarbon*	F, C	PFC-116

* the term 'per' means 'all', so all carbon-bonds are occupied by fluor atoms.

The above prefixes are followed by a set of numbers indicating exactly how many C, H and F atoms are present in the molecule, respectively. A last parameter still to be deduced, however, is the number of Cl atoms. Knowing that a linear saturated chain of x carbon atoms needs (2x + 2) substitutes and knowing the exact number of C, H and F atoms, one can easily calculate how many Cl atoms are required to complete the chemical structure. Therefore the number of Cl atoms is not explicitly mentioned, but can be deduced.

Page 2 gives further details on the assignment of numbers and letters in (H)(C)FC nomenclature.

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(Hydro)(Chloro)FluoroCarbons

CFCs, HCFCs, HFCs Haloalkanes: only saturated carbon-to-carbon bonds

Ethane-derived chains (2 carbon atoms)

H F C - 1 3 4 a

- 1: Number of carbon atoms -1
- 3: Number of hydrogen atoms +1
- 4: Number of fluorine atoms
- a: Refers to distribution of atomic weights of atoms bonded to each of the carbon atoms
  - No letter: most even distribution
  - a: next most even distribution
  - b: next most even distribution
  - c: ...

HFC-134a

2 carbon atoms
4 hydrogen atoms
4 fluorine atoms
next most even distribution
(most even = CHF_2 - CHF_2)

→ **CH_2F - CF_3**

Propane-derived chains (3 carbon atoms)

H C F C - 2 2 5 c a

- 2: Number of carbon atoms -1
- 2: Number of hydrogen atoms +1
- 5: Number of fluorine atoms
- c: Refers to distribution of atomic weights of atoms bonded to the outside carbon atoms
  - a: most even distribution
  - b: next most even distribution
  - c: next most even distribution
  - d: ...
- a: Substitution on central carbon atom
  - a: Cl_2
  - b: Cl,F
  - c: F_2
  - d: Cl, H
  - e: F, H
  - f: H_2

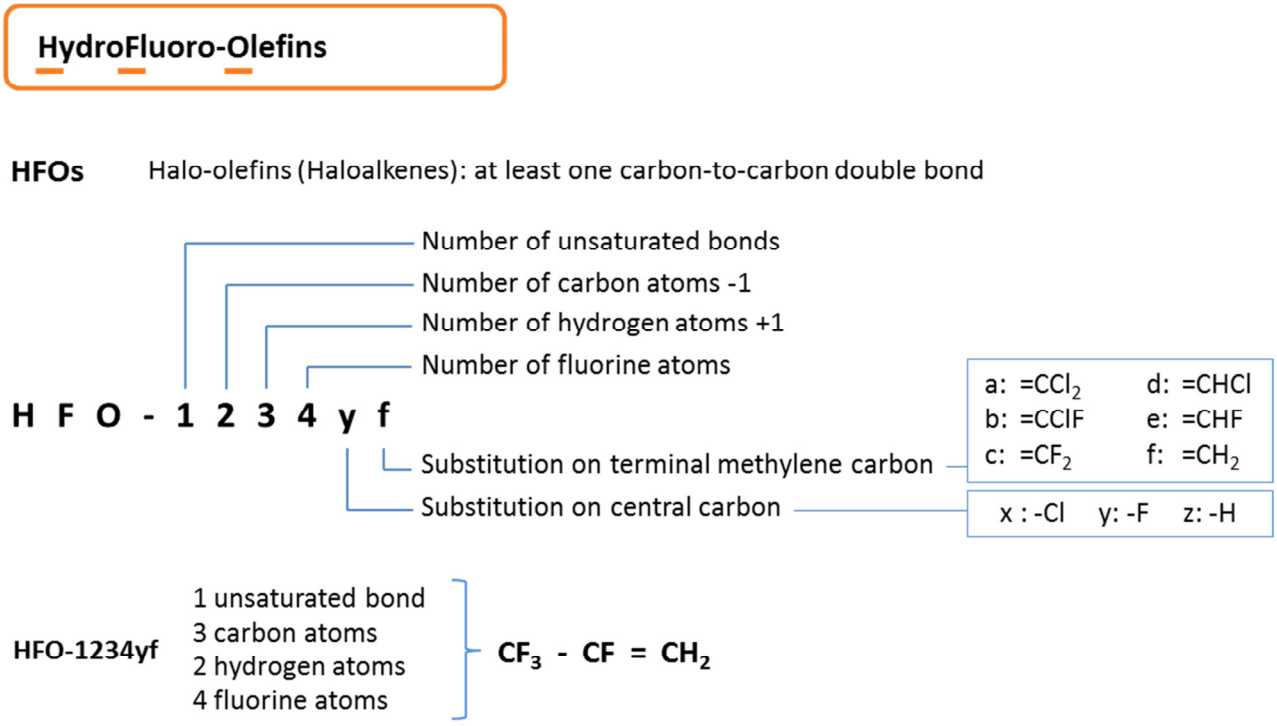
HCFC-225ca

3 carbon atoms
1 hydrogen atom
5 fluorine atoms in total
F_2 on central carbon
2 chlorine atoms
(1H + 5F form 6 of the 8 required substituents on a propane chain)

→ **CF_3 - CF_2 - $CHCl_2$**

HFOs, a special case

The prefix 'HFO' stands for HydroFluoro-Olefins or haloalkenes. These are compounds that are characterized by the presence of at least one carbon-to-carbon double bond. Their nomenclature is explained in more detail below.



As double bonds are involved, cis (substitutes on the same the same side of the double bond) and trans configurations (substitutes on opposite sides of the double bond) may need to be indicated. When four different atoms or groups are attached to the carbon atoms of the double bond, the E ('Entgegen' = opposite) and Z ('Zusammen' = together) nomenclature is used instead. Herein the letter E is added to the letter row in case the atoms or groups of higher preference[1] are on the opposite side of the double bond, whereas Z will apply for isomers in which the atoms or groups of higher preference are on the same side.

[1] In most cases higher atom number