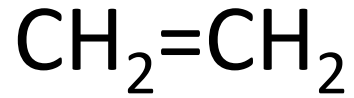


Fluorine properties



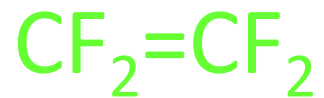
- Small (atomic radius = 72 pm)
- Most electronegative of all elements (3.98 on Pauling scale)
- Strongest single bond with C (466 kJ/mol)
- In the ionic form F^- is essential for strengthening teeth
- Source is mineral fluorite: CaF_2
- Many samples of fluorite exhibit fluorescence

Organofluorides



Ethene ethylene

forms polymers: Polyethylene PE



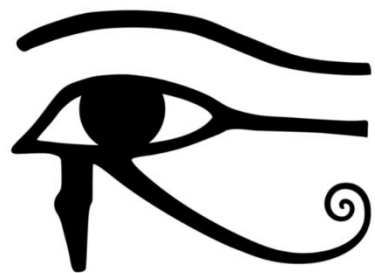
Perfluoroethene Polytetrafluoroethylene tetrafluoroethylene

forms polymers:

Polytetrafluoroethylene PTFE



Organofluorides



R_H = alkyl group e.g. $C_8H_{17}^-$



R_F = fluoroalkyl group e.g. $C_8H_{16}F^-$
perfluoroalkyl group e.g. $C_8F_{17}^-$

Poly and perfluoroalkyl substances

Acronym = PFASs

more than 3000 substances (see the review Integr Environ Assess Manag 7, 2011—RC Buck et al.)

produced and used since 1940

Myriad of applications because they are thermal and chemical resistant, water and oil repellent, the longer the chain the better the performances:

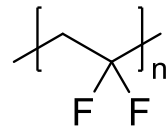
- fire fighting foams
- stain resistant coatings
- polymerisation aids
- building blocks for polymers
- ...

See more on Environment International 60 (2013) 242 -Z. Wang et al.

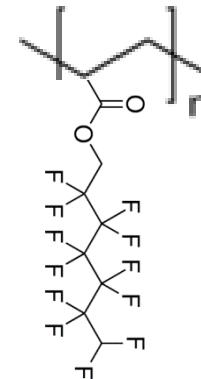
Toxicity

- Concerns for the environmental degradation products of any material containing perfluoroalkylic chains
- The longer the perfluorinated chain, the greater its persistence in the environment and binding to proteins in wildlife and human body and the more bioaccumulative it becomes
- Banning of perfluoroalkyl and polyfluoroalkyl substances with long chains e.g. PFOA (C8), PFOS (C8)

Polyvinylidene fluorides



Fluorinated polyacrylates





PhotoFluo project



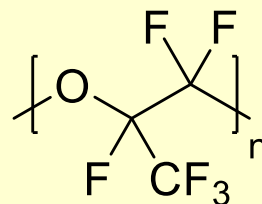
POLITECNICO
DI TORINO



Goal of PhotoFluo:

to prepare fluoropolymers that can be promising alternatives in terms of safety and performances to the perfluoroalkyl molecules, currently raising safety issues

Perfluoropolyethers



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TORINO



$$6.0221415 \times 10^{23}$$



Avogadro was born in Turin
1776 -1856