

Naturally created halogenides measured as AOX and TOCI

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A considerable amount of organically bound chlorine has been proven to be formed naturally (Holm et al). Obviously, nature is adapted to many chlorinated compounds, both naturally formed and anthropogenic of the same or similar type.

Natural concentrations of AOX

During an investigation performed by IVL (Swedish Environmental Research Institute) it was found that the concentration of adsorbable organically bound halogens (AOX) in Sweden varied between different media. In surface water the quote AOX/TOC (TOC = Total Organic Carbon) was 0,73 – 8,8 mg/g, in soil the quote AOX/(organic material) was 0,21-1,4. mg/g (kg/ton) and in groundwater AOX/FA (fulvic acids) between 0,23 and 0,37 mg/g. These waters were between 1 300 and 5 200 years old. This means that there is a large production of natural chloro-organic compounds. In a bog in Västergötland county (Komossen) the AOX-content was 300 higher than the yearly deposition. The AOX concentration in water without human activity, varied between 6 and 160 µg/l. These are concentrations in the same range as in the contaminated rivers of Germany and Netherlands. AOX mainly consisted of organic acids with a molecular weight > 500 (Asplund et al, 1989).

Functions of natural organic halogen compounds

Some organisms demand halide ions for their function, others don't. Many organic halogen compounds are secondary metabolites with unknown function. The substances are probably used for protection against predators and as pheromones. Many chlorine compounds from fungi have antibacterial activity, as chlortetracycline, chloramphenicol and griseofulvin. Several of the chloro-organic compounds are anti-microbial, anti-tumoral, enzyme inhibitors and growth-auxins (regulating growth rates) (Siuda & DeBernardis, 1973).

References:

- Holm, G., Wennberg, L., & Enell, M. (1990). *Naturlig produktion av halogenerade organiska föreningar. En litteratursammanställning*. IVL Svenska Miljöinstitutet. (<https://www.ivl.se/english/ivl.html>) *Natural production of halogenated organic compounds. A literature review* <https://www.ivl.se/publikationer/publikationer/naturlig-produktion-av-halogenerade-organiska-foreningar.-en-litteratursammanstallning..html>)
- Asplund, G., Grimvall, A., & Pettersson, C. (1989). Naturally produced adsorbable organic halogens (AOX) in humic substances from soil and water. *Science of the Total Environment*, 81, 239-248. **Naturally produced adsorbable organic halogens (AOX) in humic substances from soil and water**
Abstract The present study has shown that surface water, groundwater and soil, even in areas far from industrial activities, contain measurable amounts of adsorbable organic halogens (AOX). Although the concentrations are relatively low, the pools of AOX in the environment are considerable. In surface water, the ratio between AOX and total organic carbon (TOC) varied between 730 and 8600 µg/g. In soil, the AOX content ranged from 210 to 1400 µg AOX per g organic matter. The fact that organohalogenes (230–370 µg/g) could be detected in fulvic acids isolated from old groundwaters (1300, 4600 and 5200 yrs) indicates a large natural production of organohalogenes. This hypothesis was further strengthened by mass balance calculations for a raised bog in Sweden. The pool of AOX in this bog is at least 300 times larger than the present annual deposition. The total pool of AOX in peat in Sweden was estimated to be at least 300,000 metric tons. Potential artefacts in the analytical procedures used are discussed.
- Siuda, J. F., & DeBernardis, J. F. (1973). Naturally occurring halogenated organic compounds. *Lloydia*, 36(2), 107-143.