

## RELATION BETWEEN ORGANIC MATTER COMPOSITION AND IODINE SORPTION IN THERMALLY MATURED PEAT

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The soil organic matter (OM) retains some organic and metallic contaminants. Most often, only the quantity of OM is known to influence the sorption of the element/molecule. In the case of iodine, the sorption has been related to some specific chemical characteristics of the OM. In deed, it has been suggested that the phenolic groups of organic molecules are involved in the sorption of iodine onto OM in soils and geological materials [1]. To obtain more information on the nature of the bounds involved in retention of iodine, we assess the relation between the composition (elemental and molecular) of organic materials and their ability to sorb iodine.

The organic materials used in this study vary from fresh terrestrial organic matter (highly oxygenated) to thermally matured organic matter (highly aromatic). These materials are obtained through the progressive “thermal denaturation” of peat in high-pressure autoclaves (confined pyrolysis [2]). The initial peat is a black peat sample from a boreal peat bog. The “denaturation” is carried out for 24 hours under pressure (700 bars) at six temperatures: 150°C, 200°C, 250°C, 300°C, 350°C and 400°C. Following this treatment, the chemistry of the material is then thoroughly analyzed: C, H, O contents, molecular composition of both the extractable organic fraction (saturated and aromatic hydrocarbons and polar compounds by GC-MS) and the insoluble organic matter (by THM (Thermally assisted hydrolysis and methylation) – GC-MS), initially separated by solvent extraction. Spectroscopic characterisation is also carried out using Fourier Transformed Micro-Infrared Spectroscopy on the extractable organic matter. These analyses (molecular and spectroscopic) allow the identification of oxygenated groups (such as phenolic and polyphenolic groups) and aromatic structures and their evolution during the “thermal denaturation”. In parallel, a sorption experiment is carried out on the matured materials. The materials are shaken for 10 days with a KI solution at a 1/10 solid to solution ratio. At the end of the contact period, the solutions are extracted and analysed for total I content. A distribution coefficient ( $K_d$ ) is then calculated to assess the sorption capacity of the material.

The “thermal denaturation” of peat produces gas and solid residues. The gas production increases slowly up to 250°C and then sharply up to 400°C. Initial and pyrolysed material analyses show two trends. Firstly, the extract rate increases up to 200 mg/g of material at 300°C (oil window). This extract contains mainly polar compounds (90% of the extract, figure 1). Beyond that temperature, the extraction rate decreases dramatically. This extract contains mainly aliphatic hydrocarbons. Amounts of aromatic molecules are significant only at the highest temperature. Results are similar to those obtained by Yao et al. [3].

The sorption samples are currently being analysed.

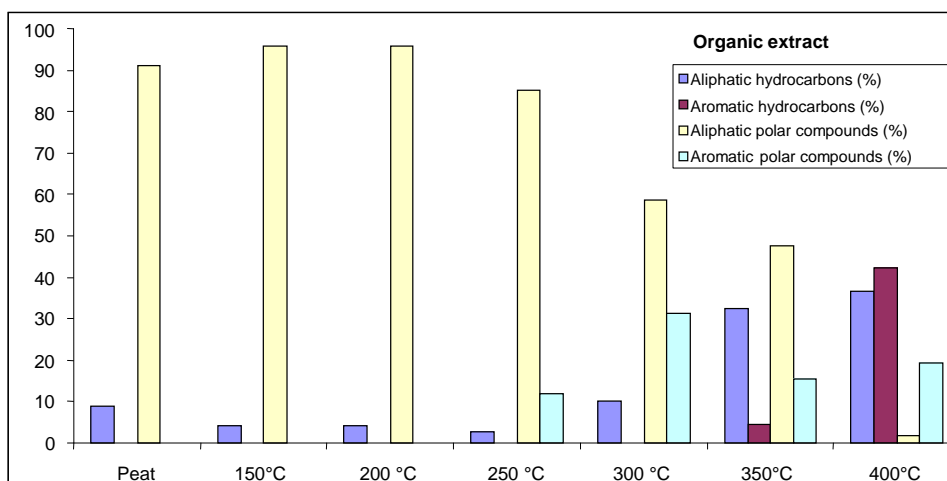


Figure 1. Molecular composition of the organic extract obtained after confined pyrolysis of peat deduced from GC-MS analyses

## REFERENCES

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