Biogenic volatile emissions and their contribution to organic aerosol mass

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Land vegetation contributes 90% of the global volatile organic compound (VOC) emissions [1]. Atmospheric oxidation of these VOCs contributes to new particle formation and atmospheric organic aerosol mass [2]. The formation of aerosols from biogenic VOC emissions constitutes a possible feedback element in biosphere-atmosphere-climate interactions due to the overall cooling effect of aerosols [3]. This is based on increasing VOC emission strengths with increasing temperature and emission patterns being invariant to temperature changes. Recently evidence emerges that temperature induced changes in VOC emission patterns may alter the picture. It has been shown that increased isoprene emissions may suppress atmospheric new particle formation [4] thus dampening the cooling effect of aerosols formed from biogenic VOCs.

In addition the use of direct emissions of VOCs from plants in experiments studying secondary organic aerosol (SOA) formation shows that, beyond the so far considered main compound classes isoprene and its derivatives monoterpenes and sesquiterpenes, other VOC classes significantly impact SOA formation. Many of these VOCs are emitted under plant stress conditions.

An overview of the state of the art knowledge of SOA formation from biogenic VOCs with respect to different VOC classes will be given. In particular we will focus on the importance of non-classical VOC classes emitted under stress conditions.

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Factors affecting the stability of slags and metal release: The case study of historical Cu slags from Lower Silesia (SW Poland)

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Historical slags originating from base metal smelting often contain considerable amounts of heavy metals and, when deposited, they may undergo potentially harmful interactions with surrounding soils, sediments and waters.

In this study we present mineralogical and chemical characteristics of historical slags from Rudawy Janowickie Mountains (Lower Silesia, SW Poland). We show that the studied slags are characterized by different cooling rates of the slag melt and we describe how these different rates affect slag properties (phase composition, metal distribution etc.). Furthermore, on the basis of leaching experiments, simulating various environmental conditions, we attempt to identify major factors controlling heavy metal release from slags.

Two types of slags produced during historical smelting of Cu ores occur in the studied area. The prevailing massive slag consists of silicate glass, olivine and hercynite. The second type is porous and comprises two types of silicate glass, olivine, ferrosilite, cristobalite and quartz. Both types contain important amounts of metals (up to 1.34 % of Cu).

The morphology of olivine crystals, phase assemblages, phase chemistry and distribution of trace elements in slag phases vary from sample to sample, which is consistent with different cooling rates. Careful investigation of cooling conditions is useful to predict susceptibility of slags to weathering. Leaching tests, performed on each type of slag show that the heavy metal release is more important for porous slags than for those having massive texture. Furthermore, larger proportions of heavy metals are released from slags formed under disequilibrium conditions than from those which cristallized under close to equilibrium conditions.

Mineralogical and geochemical analyses coupled with leaching experiments indicate that the most important factors controlling metal release from slags are: (1) textural characteristics and permeability of the material, (2) slag mineralogy and cooling rates, (3) environmental conditions (e.g. pH, organic matter content).