Influence of organic matter and microbial activities on the mobility of arsenic and metals in polluted soils

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Abstract ASWEP

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Name(s) of the author(s): Hugues Thouin[1], Tiffanie Lescure[2], Pascale Gautret[3], Catherine Joulian[4], Claude Le Milbeau[3], Fabienne Battaglia,Brunet[2]

Author affiliation(s):

[1] BRGM, ISTO, UMR 7327, BP 36009, 45060 Orléans, France

[2] BRGM, Water, Environment and Ecotechnology Division, Environmental Biogeochemistry and Water Quality Unit, 3 avenue Claude Guillemin, UMR 7327, BP 36009, 45060 Orléans, France

[3]ISTO, UMR 7327, Campus Géosciences, 1A rue de la Férolerie, 45071 Orléans Cedex 2

[4] BRGM, Water, Environment and Ecotechnology Division, Environmental Biogeochemistry and Water Quality Unit, 3 avenue Claude Guillemin, 45060 Orléans, France

Oral

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Abstract text;

Processes of remediation on anthropogenic polluted sites often involve the addition of organic amendments to restore soils biological functions and physic-chemical properties. However, interactions between organic matter and bacterial activities with inorganic pollutantsdrive many biogeochemical reactions influencing metal(loids) mobility. Incubation experiments were performed with four polluted soils sampled on industrial and mining sites all,containing high concentration of arsenic, iron, together with lead and antimony on one site. Soils were incubated in aerobic slurries, with or without addition of a complex mixture of organic substances. Abiotic controls were prepared with autoclaved soils. Arsenic speciation and concentrations of total arsenic and metals were determined at the beginning and at the end of incubation together with bacterial biomass and diversity. Results showed that without organic matter addition, micro-organisms contribute to reduce As and metal concentrations in the aqueous phase. In contrast, when organic matter was added, micro-organisms enhanced As(III), total arsenic and lead concentrations in the liquid phase. Only iron concentration was not increased by microbial activity when organic matter was added, suggesting that As and lead mobilization were not linked to bioreduction of iron oxides, but involved other biogeochemical mechanisms. The addition of organic matter may (i) enhance the solubilizationby chelation of metal(loids),and/or (ii) influence bacterial activitiesdirectly influencing metal(loids) speciation and mobility. These processes need to be better understood in order to avoid mobilization of toxic elements from soils that may be enriched in organic matter, through amendment or growth of vegetal cover.This work was performed in the frame of Labex VOLTAIRE ANR,10,LABX,100,01.