Transport of endocrine disruptive compounds in Hawaiian soils

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The release of endocrine distruptive compounds (EDCs) into the environment is of increasing concern due to their impact on freshwater organisms, ecosystem sustainability and human health. Several studies have emphasized that extended exposure to low concentration of some hormones can alter the endocrine and reproductive systems of aquatic animals. This study was conducted to investigate the transport behavior of two natural EDCs (17 beta estradiol, E2 and estrone, E1) in several Hawaiian soils under different experimental conditions. Soils collected in Hawaii showed higher cotent of mineral oxides, such as iron and manganese oxides compared to most soils in the continental US. Batch sorption and column leaching experiments were used to better understand the fate of both chemicals.

During batch experiments, equilibrium conditions were reached within 12 hours. In all soils having E2 only, its loss occurred due to sorption and degradation. Microbial degradation was inhibited using sodium azide. 100 mg/L azide alone did not completely stop degradation of E2. It was unclear whether this loss was due to microbes or partially due to abiotic mechanisms.

Column experiments showed that with E2 only, E1 was constantly present, showing the degradation of E2 to E1 despite the addition of a sodium azide. For different soils (5 total), breakthrough curves (BTC) of E1 and E2 appeared after the BTC of bromide, suggesting the presence of sorption process during the transport of estrogens through the soil matrix. Facilitated transport was mostly observed in presence of volcanic ash soil. The presence of recycled water enhanced the transport of estrogens in all the different soils. Early appearance of peaks, long tails and complete recovery (mass balance) of both estrogens was more pronounced in transport studies involving the recycled water. Non-equilibrium conditions were observed during the study, especially in presence of undisturbed soil when flow interruption occurred. These conditions were mostly related to the presence of macropores in the soil. Macropores were able to reduce the contact time between soils and estrogens, facilitating their transport.

The oxygen isotopic composition of xenoliths from Tallante (Southern Spain): Evidence for crust recycling into the mantle

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Mantle xenoliths from Tallante (Betic Cordillera, Spain) include samples recording a peculiar distinct style of metasomatism that induced orthopyroxene, plagioclase, phlogopite and amphibole crystallization and generated "hydrous" opx-rich mantle domains. The latter are locally crosscut by felsic veinlets containing plagioclase and orthopyroxene ± quartz ± phlogopite ± amphibole. The observed parageneses and available Sr-Nd-Hf isotopic data suggest that metasomatic agents were related to recycling of crust components within the mantle, plausibly in connection with subduction processes occurred during the Cenozoic Betic orogenic cycle.

In this study we investigated representative samples of composite xenoliths consisting of peridotite crosscut by felsic veins (varying in size from centimetric to millimetric) and unveined peridotites, measuring the $^{18}O/^{16}O$ ratios of the constituent minerals by laser fluorination. Results show that the narrow O-isotope compositional "typical" of mantle rocks, and the limited oxygen isotope fractionation at mantle temperatures, make oxygen isotopes a powerful tool for identifying recycled crustal material in the mantle. Orthopyroxene and plagioclase of the centimetric vein show $\delta^{18}O$ values of +9.8 and +10.6‰, respectively, whereas clinopyroxene of the surrounding peridotite country rock has $\delta^{18}O$= +6.2‰. Plagioclase of two distinct millimetric felsic veins show $\delta^{18}O$ of 7.6 and 7.3‰. The $\delta^{18}O$ values significantly higher than typical mantle ones provide insights to the genesis of the Cenozoic subduction-related magmas of the Betic region that include silica-oversaturated calcalkaline (s.l.) and lamproite products, possibly resolving source vs. shallow level crustal contamination of the magmatic rocks. Moreover, the different O-isotope composition recorded in veinlets characterized by different thickness could provide insights into diffusion-assisted O-isotope requilibration of mantle rocks, thus constraining the time for "crust digestion" into the mantle.