

Publication

Metal biogeochemistry in constructed wetlands based on fluviatile sand and zeolite- and clinopyroxene-dominated lava sand

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Author(s) Huang, Jen-How; Paul, Sonja; Mayer, Silke; Moradpour, Eloise; Hasselbach, Ralf; Gieré, Reto; Alewell, Christine

Author(s) at UniBasel Huang, Jen-How ; Alewell, Christine ; Paul, Sonja Marit ;

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For the first time, speciation of Fe, Mn, Zn, Ni, Cu and Pb was determined along the profiles of 8 constructed wetlands (CWs) consisting of fluviatile sand (Fluv), clinopyroxene-dominated lava sand (CI-LS) and zeolite-dominated lava sand (Ze-LS), aiming at quantifying metal behaviour in CWs and the impact caused by different filter materials. With the exception of Mn, which underwent reductive dissolution, CWs were sinks for the studied metals. Metal accumulation rates differed in the following order: Ze-LS \geq -LS >CWs, reflecting the highest metal adsorption capacity and the lowest hydraulic conductivity of Ze-LS. Sequential extraction data indicated the highest metal mobility (readily mobilised and adsorbed fractions summing up to 60%) in Fluv CWs, implying a higher risk of metal release into adjacent environments if Fluv from CWs will be improperly disposed after usage. Zinc and Ni were transported into the deeper CW layers to a larger extent than Cu and Pb, reflecting adsorption affinity to all filter materials in the order of Pb>>>. Therefore, understanding metal speciation and mobility in such materials is crucial when they are considered for application as filters in CWs.

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