

Removal of arsenic from leachates of decaying *Sargassum* biomass in a natural iron material-based biofilter

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Groundings of algae belonging to the genus *Sargassum* have affected the coasts of the Caribbean basin since 2011. The algal biomass, dumped near the littoral releases, during degradation and leaching by rainwater, some arsenic (As) that was accumulated at sea: 50 to 80 mg of As per kg of dry matter. One of the objectives of the SargAs&CLD project funded by the ANR (Sargassum Joint call 2019) was to develop low-cost passive treatment solutions to remove As from these leachates. Adsorption on iron minerals is one of the most efficient processes to immobilize As, often applied in classical water treatment plants. However, this option was never tested with complex effluents, containing high concentration levels of salts and diverse organic compounds, such as in *Sargassum* leachates. Moreover, industrial adsorbents are expensive. The present study was thus performed with a natural iron-rich (mainly in the form of goethite) soil available in the Martinique Island, in order to develop a biofiltration process based on the use of local raw materials. First, a metric pilot was used to produce natural *Sargassum* leachates containing As, by simulating, in laboratory conditions, the degradation of algal biomass during storage and exposure to raining events. The early effluents contained 3 to 7 mg/L As, including AsIII, AsV, dimethyl AsV and arsenobetaine. Then, they were used to test a biofiltration process with the aim to retain arsenic. According to the high pH of the effluents (7.5 to 9.5), AsIII was supposed to be more efficiently adsorbed than AsV, thus the biofilter worked in anaerobic conditions favoring AsV bio-reduction. FeIII bio-reduction was also expected in order to induce the formation, at the outlet of the biofilter, of new amorphous FeIII-oxides presenting a higher potential for As adsorption than crystallized FeIII minerals. A laboratory (300 mL) biofilter was continuously fed for 5 months with the *Sargassum* leachates maintained under anaerobic conditions. The feeding solution was initially supplied without any modification, then enriched with acetate, a well-known electron donor in bacterial anaerobic respiration processes. A diverse bacterial community that evolved with time was retrieved by 16S rRNA gene metabarcoding. Acetate seemed to improve the efficiency of As removal in the biofilter (from 40% to 90% As trapping) that was associated with the production of solid FeII-bearing phases and removal of AsV from the water phase. Results show the potential of natural local soils to develop passive biofilters removing As from *Sargassum* leachates.