A.1 Technology Name

Polymeric Sampling Devices

A.1.1 Source

Beckingham, B., and U. Ghosh. 2013. Polyoxymethylene Passive Samplers to Monitor Changes in Bioavailability and Flux of PCBs after Activated Carbon Amendment to Sediment in the Field. Chemosphere 91(10),1401–1407. https://doi.org/10.1016/j.chemosphere.2012.12.074.

A.1.2 Summary

Media:	Water column, Pore Water
Study Type:	In-situ (interface and water column) and ex-situ (porewater)
Technology:	Polyoxymethylene (POM)
Peer Reviewed:	Yes
Publication Date:	June 2013

A.1.3 Site Description

- The pilot study site was located about 5.6 kilometers downstream from the former industrial source of PCBs at the lower Grasse River.
- In 2006, granular activated carbon (GAC) at a target dose of 3.75% by dry weight was applied to the top ~15 cm of sediments (PCB concentrations ranging from 2.0 to 4.0 mg/kg, and average total organic carbon content of 5.8%).(Beckingham and Ghosh, 2011)
- In-situ POM passive samplers (55 µm thick) was deployed at sediment–water interface (0 cm), and three heights (7.5 cm, 30 cm and 60 cm) above the sediment bed for 14-days. Monitoring was conducted before application in fall 2006, and at yearly monitoring events in 2007, 2008 and 2009 in background and treatment areas.
- Ex-situ POM (30-days) was used to measure porewater concentrations in 2009.
- POM-based results were not adjusted for disequilibrium.
- Ex-situ POM porewater concentrations were compared to in-situ POM water column concentrations at 7.5 cm above the sediment bed to determine the PCB flux between sediment and water.

A.1.4 Remedial Phase

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A.1.5 Outcome

POM samplers were used to measure changes in the PCBs bioavailability and sediment-to-water flux in the Grasse River after the sediments were treated with GAC. Following amendment, POM water column concentrations were similar across all sites, indicating that the water column was well mixed and not impacted readily by the small footprint of the GAC-amended areas. In contrast, freely-dissolved PCB concentrations at the sediment–water interface (0 cm) decreased significantly after treatment (by 62-91%), although some increase in PCBs was observed over time likely due to deposition of untreated sediments over the treated

area. PCBs in sediment porewater in treated area was also lower than overlying water concentrations indicating sediments acted as a sink of PCBs. The reduction in sediment porewater PCBs is consistent with reductions in PCBs bioaccumulation in a freshwater invertebrate. These observations indicate that GAC amendment to sediment limits contaminant exposure to both the benthic and pelagic food webs through reductions in bioavailability and flux of PCBs into the water column. Passive samplers are suited for monitoring bioavailability change after remediation.

A.1.6 References

Beckingham, Barbara, and Upal Ghosh. 2011. Field-Scale Reduction of PCB Bioavailability with Activated Carbon Amendment to River Sediments. Environmental Science & Technology 45(24): 10567–10574. https://doi.org/10.1021/es202218p.