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Occurrence and microbial degradation of phthalate esters in Taiwan river sediments

S.Y Yuan [a] ... B.V Chang [b]

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Abstract

Concentrations and microbial degradation rates were measured for eight phthalate esters (PAEs) found in 14 surface water and six sediment samples taken from rivers in Taiwan. The tested PAEs were diethyl phthalate (DEP), dipropyl phthalate (DPP), di-*n*-butyl phthalate (DBP), diphenyl phthalate (DPhP), benzylbutyl phthalate (BBP), dihexyl phthalate (DHP), dicyclohexyl phthalate (DCP), and di-(2-ethylhexyl) phthalate (DEHP). In all samples, concentrations of DEHP and DBP were found to be higher than the other six PAEs. DEHP concentrations in the water and sediment samples ranged from ND to 18.5 Î¼g/l and 0.5 to 23.9 Î¼g/g, respectively; for DBP the concentration ranges were 1.0â€“13.5 Î¼g/l and 0.3â€“30.3 Î¼g/g, respectively. Concentrations of DHP, BBP, DCP and DPhP were below detection limits. Under aerobic conditions, average degradation half-lives for DEP, DPP, DBP, DPhP, BBP, DHP, DCP and DEHP were measured as 2.5, 2.8, 2.9, 2.6, 3.1, 9.7, 11.1 and 14.8 days, respectively; under anaerobic

conditions, respective average half-lives were measured as 33.6, 25.7, 14.4, 14.6, 19.3, 24.1, 26.4 and 34.7 days. In other words, under aerobic conditions we found that DEP, DPP, DBP, DPhP and BBP were easily degraded, but DEHP was difficult to degrade; under anaerobic conditions, DBP, DPhP and BBP were easily degraded, but DEP and DEHP were difficult to degrade. Aerobic degradation rates were up to 10 times faster than anaerobic degradation rates.

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Keywords

Phthalate esters; Sediment; Microbial degradation; Taiwan river pollution

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