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Mass Balance Study of Nonylphenol Ethoxylates and Their Metabolites in an Urban River Contaminated by Nonylphenol

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(Received February 23, 2007; accepted August 17, 2007)

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Key words: nonylphenolic compounds, urban river, mass balance, chloride ion, river sediment

In previous studies, an urban river called Kamo River was found to be polluted with nonylphenol (NP) by a rubber product manufacturing factory. To determine the contribution of the factory effluent to the river pollution, a mass balance study was conducted for NP, nonylphenol ethoxylates (NP*n*EOs, n = 1–15), and nonylphenol carboxylates (NP*m*ECs, m = 1–10) in the waters of the river and its 10 inflow channels. The total concentration of nonylphenolic compounds (T-NPCs) in the river water was 4.6 nM/L at the upstream sampling point and 54.6 nM/L at the downstream sampling point. T-NPCs concentration ranged from 0.4 to 487.1 nM/L in the waters of the inflow channels connected to the targeted river section, and the highest value was observed in the water of the inflow channel which receives the factory effluent. The mass flows of T-NPCs were 458.0 mM/day for Input (the upstream sampling point and outlets of 10 inflow channels) and 828.2 mM/day for Output (the downstream sampling point). The mass flow of the highly polluted inflow channel comprised 82.4% of Input. In comparison with the mass balance of chloride ion, the mass flow of T-NPCs in Output was still higher than that in Input. This phenomenon was attributed to the high mass flows of NP and NP*n*EOs (n = 1–3) in Output, and their potential source was determined to be the river sediment.