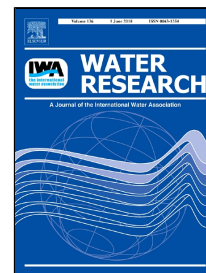


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Tire wear particles in the aquatic environment - a review on generation, analysis, occurrence, fate and effects



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1 Tire wear particles in the aquatic environment - a review on generation,
2 analysis, occurrence, fate and effects

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12
13 **Abstract**

14 Tire wear particles (TWP), generated from tire material during use on roads have gained increasing
15 attention as part of organic particulate contaminants, such as microplastic, in aquatic environments.
16 The available information on properties and generation of TWP, analytical techniques to determine
17 TWP, emissions, occurrence and behavior and ecotoxicological effects of TWP are reviewed with a
18 focus on surface water as a potential receptor. TWP emissions are traffic related and contribute 5 –
19 30 % to non-exhaust emissions from traffic. The mass of TWP generated is estimated at 1,327,000 t/a
20 for the European Union, 1,120,000 t/a for the United States and 133,000 t/a for Germany. For
21 Germany, this is equivalent to four times the amount of pesticides used. The mass of TWP ultimately
22 entering the aquatic environment strongly depends on the extent of collection and treatment of road
23 runoff, which is highly variable. For the German highways it is estimated that up to 11,000 t/a of TWP
24 reach surface waters. Data on TWP concentrations in the environment, including surface waters are
25 fragmentary, which is also due to the lack of suitable analytical methods for their determination.
26 Information on TWP properties such as density and size distribution are missing; this hampers
27 assessing the fate of TWP in the aquatic environment. Effects in the aquatic environment may stem
28 from TWP itself or from compounds released from TWP. It is concluded that reliable knowledge on

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