



MSc Thesis in Environmental Chemistry

Title of Thesis: Environmental Risk Assessment of 6PPD and its Alternatives

Description / Project:

6PPD is one of the most common synthetic antioxidants/ antiozonants used in vehicle tires. 6PPD is mobile within rubber and slowly migrates to the surface where it forms a "scavenger-protective film" that reacts with ozone and other free radicals more quickly than the ozone/ radicals can react with the rubber. During this process, 6PPD-quinones are formed. 6PPD and 6PPD-quinones enter the environment through tire-wear particles and reach river systems via urban runoff. This is of great concern as 6PPD-quinones are acutely toxic to aquatic life and are responsible for massive coho salmon mortality events. Several alternatives to 6PPD are on the market, the most important ones being DPPD, 77PD, DNPD, 7PPD, IPPD, DNODPA, MHPPD, and 44PD. While the reactive pathway of 6PPD and the toxicity of its transformation product is well understood, little is known about the suggested alternatives.

The goal of this project is to elucidate potential environmental hazards of 6PPD alternatives. Therefore, the student will (i) perform abiotic and biotic transformation experiments, (ii) measure and model transformation kinetics of 6PPD and its alternatives, (iii) predict potential transformation products and (iv) conduct a targeted and non-targeted search for transformation products. Measured HR-MS data will further be used to explore the MLin vitroTox tool to elucidate the compounds potential toxicity pathways. Gathered data will allow for a first environmental risk assessment of the 6PPD alternatives.

Methods:

Medium scale transformation and sorption experiments, HR-MS/MS, Skyline/ Tracefinder, R Software/ Python

What we expect from you:

- Interest in environmental chemistry and risk assessment of chemicals
- Interest in learning new laboratory methods as well as exploring softwares to analyse HR-MS/MS data
- Interest in learning data analysis/ modelling languages to evaluate measured data
- Team work
- Experimental work will be conducted at Eawag (Dübendorf)

Starting date: Anytime

Research Group: Prof. Kathrin Fenner

Supervisor / Contact:

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