

Assessment of the safety and performance of a low-cost filter material for treatment of landfill leachate and industrial wastewater using an integrated approach based on ecotoxicological testing and chemical analysis

Veronica Ribé¹, Emma Nehrenheim¹, Monica Odlare¹, Sylvia Waara¹, Åke Forsberg¹ and Bert Allard²

¹ Mälardalen University, ² Örebro University

No preference for **oral or poster** presentation

Ecotoxicological tests are frequently used as a complement to chemical analysis in hazard assessment of contaminated water, as they can detect toxic effects resulting from interactions of contaminants. They are, however, less commonly used in water treatment method development, where they can provide a rapid and low-cost means of evaluating the efficiency and safety of a new treatment method. This is particularly valuable when treating waters with a complex contaminant matrix, such as landfill leachates and industrial wastewaters.

Pine bark, which is an industrial by-product from the forestry industry, has been extensively investigated as a low-cost filter material and it has been shown to efficiently remove metals from solution, storm water run-off and landfill leachate. Additionally, it has also been demonstrated to retain phosphorous, uranium and organic compounds, such as lindane and pentachlorophenol, from water. Pine bark is therefore an interesting alternative to more expensive methods for treating waters contaminated with a mixture of organic and inorganic pollutants, e.g. activated carbon.

Although a promising low-cost sorbent, concerns have been raised about using pine bark for water treatment due to the leaching of organic acids and phenols from the unused filter material, particularly during the initial filtration phase. To ensure the environmental benefits and safety of using the filter material it is important to determine the extent and composition of the leaching of organic material from the unused material.

This study shows how an ecotoxicological test battery in combination with chemical analyses was used to evaluate the safety of using pine bark for water treatment. Leachates from the ISO standardized leaching test 12457-2 was analysed for metals, dissolved organic carbon (DOC) and phenols. The toxicity of leachates with and without pH adjustment was assessed using the freshwater crustacean *Daphnia magna*. The performance of the filter material when treating low-strength landfill leachate and industrial wastewater was assessed in batch tests followed by chemical analysis and a bioassay test battery consisting of bacteria, aquatic plants and invertebrates.