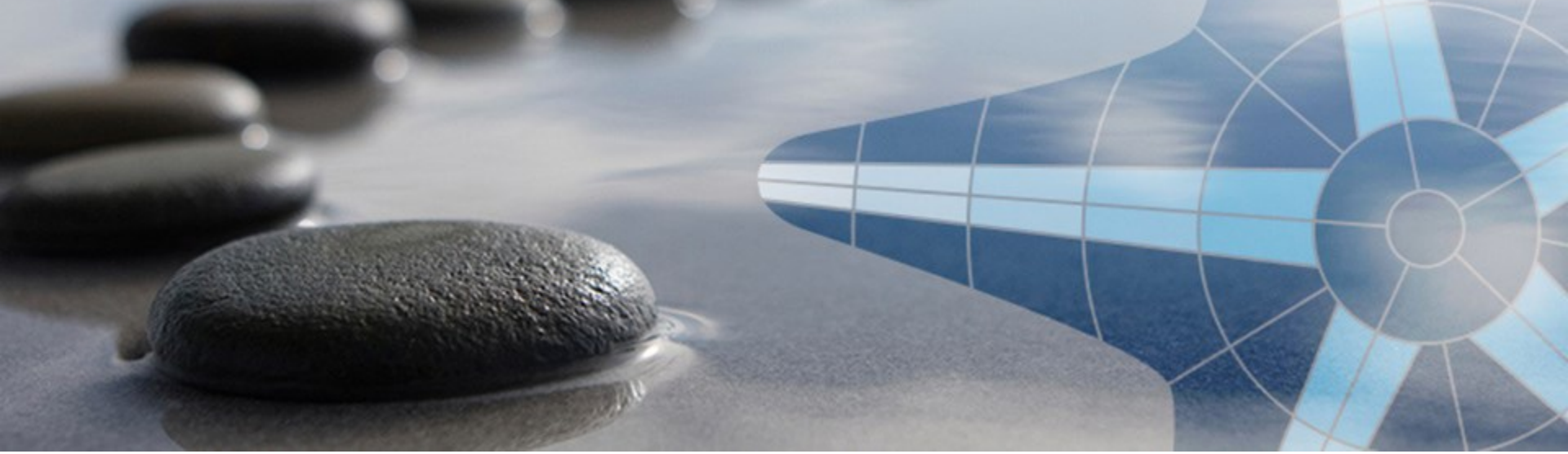

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Treatment and Management of Organotin and Metal Contaminated Sediment

PhD student Anna Norén[a], Assoc. prof. Karin Karlfeld Fedje[a,b],
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[a]Chalmers University of Technology, [b]Renova waste and recycling company

Renova

RE: SOURCE

FORMAS

IMMERSE 1st Transnational Exchange Lab,
12 June 2019

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Why this research?

Ash
Soil
Sediment

Contaminated material

Metal recovery

Sustainable development

Previous research

Acidic leaching and chemical precipitation for metal recovery

Waste ash, 3% Zn

- **70% Zn recovery**
- **Product with 50% Zn**
- **Full-scale plant under construction**

Ash from contaminated bark, 2% Cu

- **>80% Cu recovery**
- **Product with 40% Cu**

Soil 0,2% Cu

- **50% Cu recovery**
- **Product with 10% Cu**

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Can similar approach be used on sediment?

- **Extra challenges**
- Organic compounds **and** metals
- Lower metal content

- **Potentials**
- Decreased landfilling
- Decreased transports
- Saves natural resources
- Metal recovery
- Circular economy

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Aim and goal

- Environmental adaptable methods for sustainable treatment of OTs and metal contaminated sediments

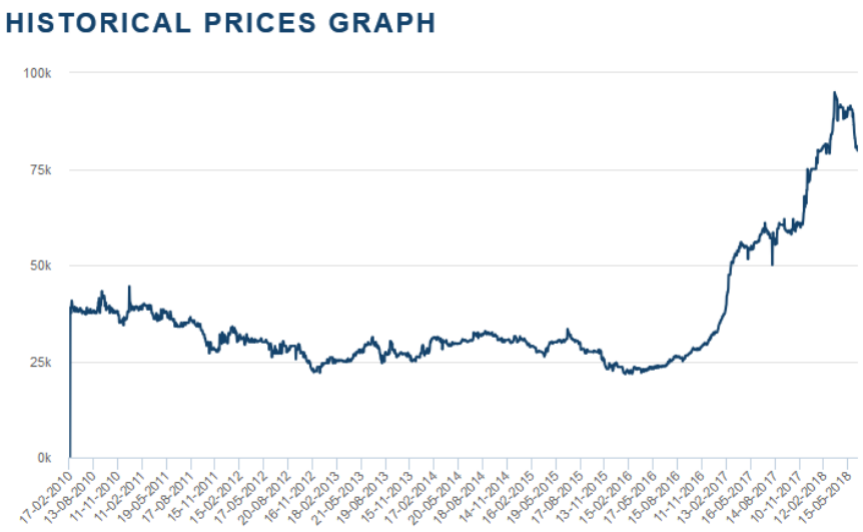
- Less disposal and landfilling
- Higher utilization of resources (material and metals)

The sediment research team in IMMERSE:

+ PhD student Anna Norén Chalmers
+ Associate Professor Karin Karlfeldt Fedje Renova/Chalmers
+ Professor Ann-Margret Strömvall Chalmers
+ Professor Yvonne Andersson Sköld VTI/Chalmers
+ Professor Sebastien Rauch Chalmers
+ Associate Professor Oskar Modin Chalmers
+ MSc Anna Wilhelmsson COWI
+ MSc Kristina Bernstén COWI

Metal prices

Cobalt



Tin

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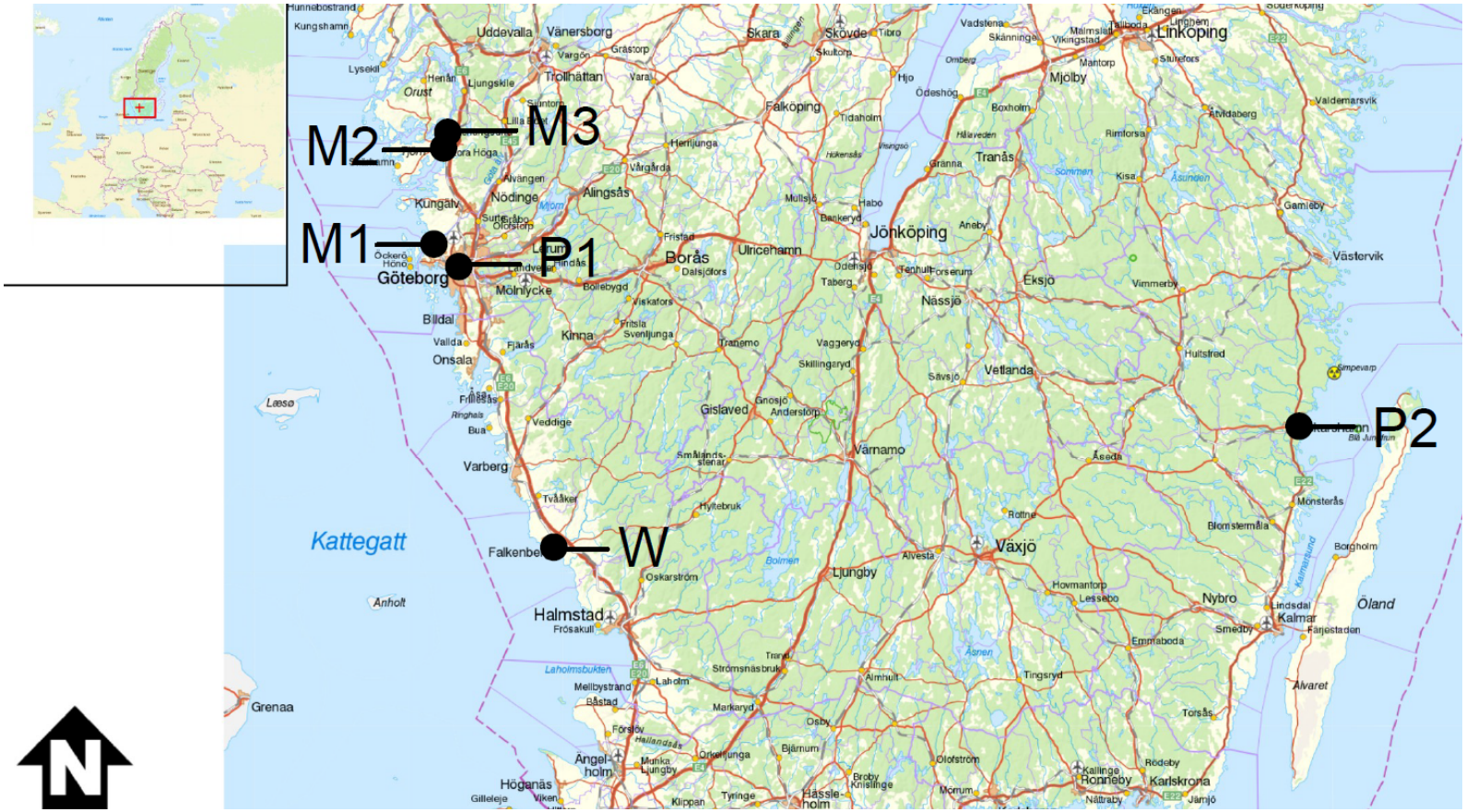

Sediment characterization

+ TBT is the main problem
+ Cu, Zn, As

+ Determines possible management alternatives

Summary

+ Useful approach for deciding management options, assessing environmental and economical aspects
+ Need for metal and organotin extraction technology

  Treat specific particle size or metall (Cu, Zn…)
+ Other treatment methods then leaching

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Photoelectrocatalytic degradation of TBT, organic pollutants, microplastics, and simultaneous metal recovery?

Hypothesis: If combining techniques for chemical oxidation, photocatalytic oxidation, and electrolysis it will be possible to degrade organic pollutants, microplastics and TBT; and simultaneously recover metals as for example tin, copper and zinc.

This method can also be useful for sustainable and innovative treatment of, for example, highly polluted street dust and sand, road runoff, urban stormwater sediment, contaminated soil.

Photoelectrocatalytic experiments for degradation TBT and recovery of tin:

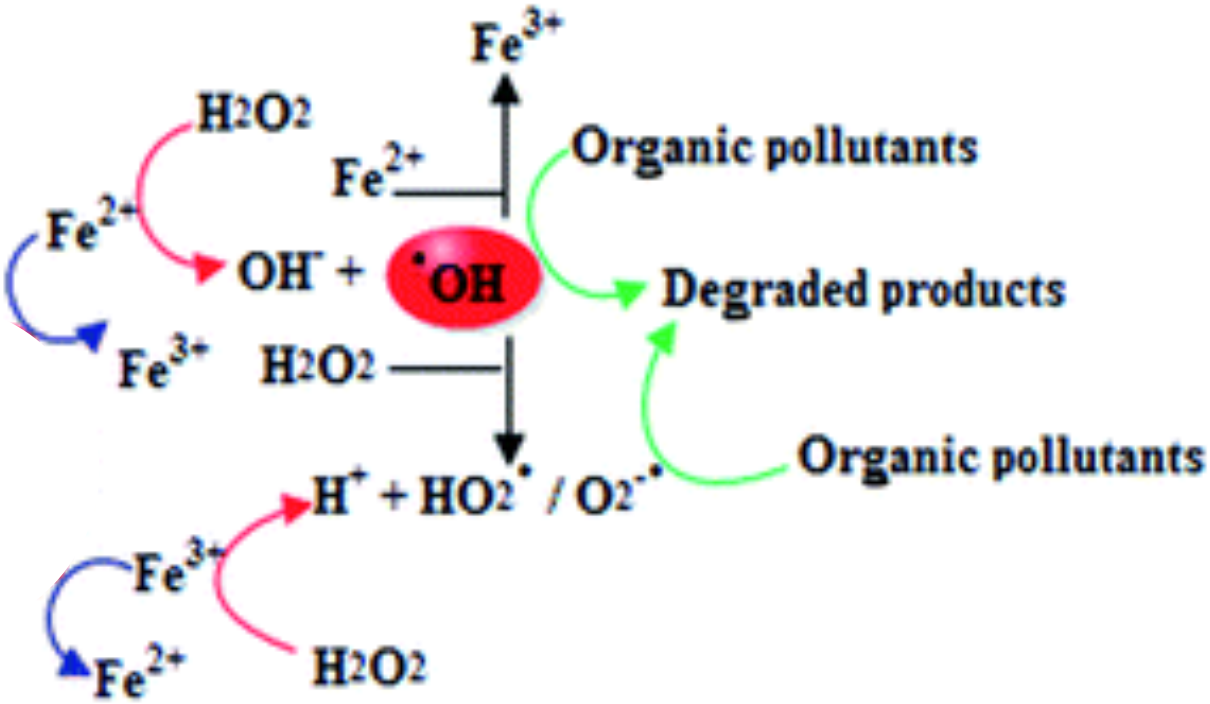
Step 1. Fentons reagens (oxidation, degradation)

Step 2. Electrochemical oxidation with metal recovery (oxidation, degradation, metal recovery)

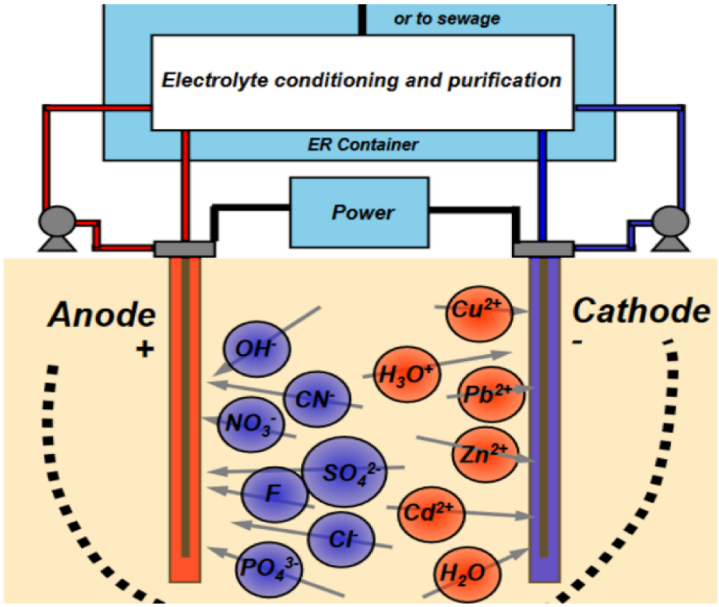
Step 3. Photocatalytic degradation (photoxidation, photodegradation)

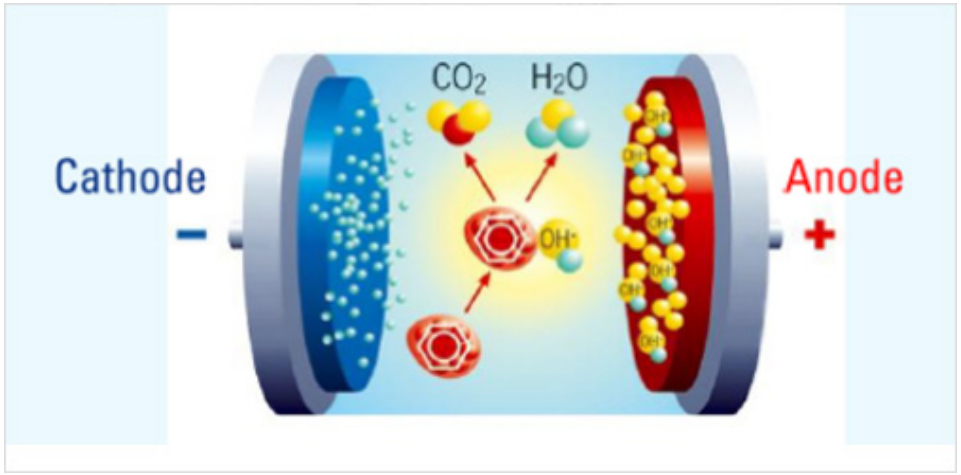
Step 4. Combine 2 – 3 and 1 – 3

Step 1. Fenton's reagent

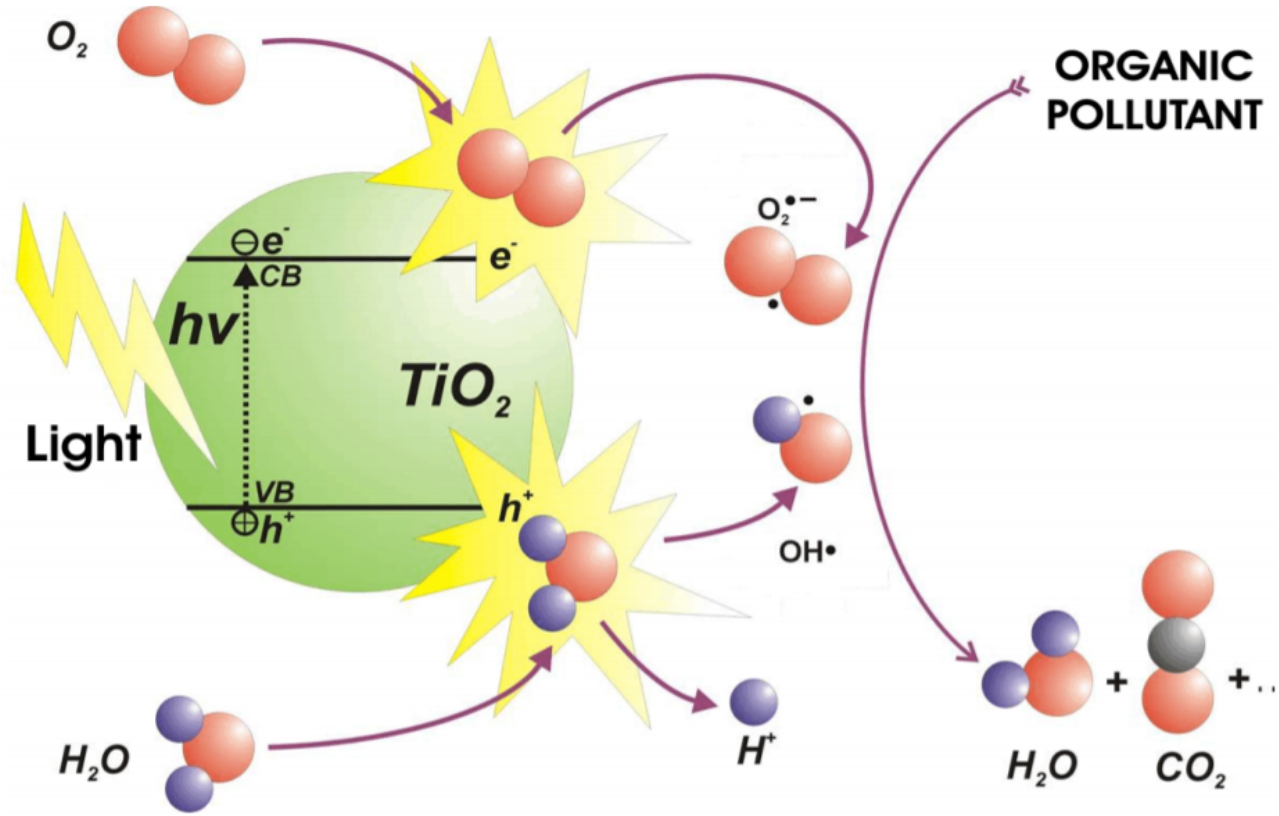


Step 2. Electrochemical oxidation with metal recovery





Step 3. Photocatalytic degradation



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Phytoremediation

- Hypothesis
- OTs are degraded and/or enriched in the plant.
- Metals are enriched in the plant.
- Incineration of the plant enhances recovery of the metals.

- Challenge…
- Salt water sediments

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Growth

Just planted…

After 1 month…

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