

New method for efficient removal of uranium and other heavy metals from water

December 11 2013

A new and efficient method for the removal of uranium and other heavy metals from water has been developed at the University of Eastern Finland. Chemec Ltd., a Finnish chemicals industry company, has purchased the rights in the invention and will introduce the method to the commercial markets. Binding metal ions to a solid material, the CH Collector method can be used within the mining industry, and also in the removal of emissions caused by the chemicals and metals processing industries.

Chemec's CH Collector method is a potential solution to issues relating to the dangers and recovery of [uranium](#), which have been a topic of much debate in Finland lately. Uranium is a mildly radioactive and poisonous heavy metal, which is naturally occurring in some parts of the Finnish bedrock. When mining other metals such as gold, uranium may be present as an impurity in mining wastewaters. A complete removal of uranium from solutions is difficult due to the fact that uranium takes different forms depending on the acidity of the solution. The removal of other heavy metal emissions such as lead, mercury, cadmium and zinc from waters is also challenging.

Recovering even small amounts of metal

Traditionally, metal ions are removed from solutions with the help of chemical coagulants or ion exchangers, which usually require adjustments to the solution's pH or significant extra energy in order to

function efficiently. Professor Jouko Vepsäläinen's research group at the UEF School of Pharmacy has developed a new method enabling an efficient removal of metal ions from solutions without the need to use any auxiliary substances. The CH Collector method is based on the use of a solid material which collects metal ions directly from the solution. University researcher Petri Turhanen had a central role in the development of the new method.

The solid material developed by the researchers belongs to the aminobisphosphonate family, which are also used in, for example, osteoporosis medications. The invention is unique, as no other metal absorbents working on the same principle are in use. "Ion channels are formed inside the material, in which the metal ions are collected from the solution," Professor Vepsäläinen explains.

The new material collects metal ions directly from the solution. The collection of metals does not require a separate precipitation step or any adjustments to the solution's pH. For instance, an efficient recovery of uranium is possible from a very wide pH range and even in cases where the solution is rich in other naturally-occurring [metal](#) ions such as sodium, magnesium or calcium. "Unlike traditional methods, the CH Collector method also allows the recovery of metals occurring in very small concentrations."

The new method enabled practically a complete removal of uranium from water samples taken from Finnish mines. There was no need to pre-process the samples even though they contained very high concentrations of other metals possibly disturbing the process. The efficiency of the method was also tested on an ore sample that contained scandium. The sample was dissolved and then treated with the new material. The two-phase process made it possible to recover 98% of the scandium.

The new method is well-suited for the removal of metals not only from

the wastewaters of the mining industry, but also from the wastewaters of the metals processing and chemical industries, which may contain heavy metals and uranium in particular.

Selective recovery of metals moves forward

At the University of Eastern Finland, inventions are currently being commercialised more frequently than ever before. According to UEF Academic Rector Jukka Mönkkönen, this is one of the goals of academic research.

"In the commercialisation of this invention, Tekes's New knowledge and business from research ideas funding instrument and the contacts found via Geological Survey of Finland played an important role. A number of companies were interested in purchasing commercial rights in the invention. The partner company was selected on the grounds of promoting as efficient and as wide a use of the invention as possible. This is why we regarded Chemec as our ideal partner," says Business Development Advisor Matti Höytö of the University of Eastern Finland.

R&D activities around the CH Collector method will continue. Chemec and the University of Eastern Finland are participating in Tekes's Green Mining Programme which seeks to enhance the selective recovery of metals and to create a novel, optimised concept for the treatment of [mining industry](#) wastewaters and process waters.

"The goal is to create a toolkit for the selective recovery of different metals with the help of bisphosphonates. In the future, these kinds of methods could enable a targeted recovery of rare and valuable earth metals from complex mixtures containing [metal ions](#)," Professor Vepsäläinen says.

"This project strengthens the position of Chemec Group on the

European export markets and opens possibilities for an increasingly broad mining customer base also outside Europe," Chemec CEO Tapani Niskanen says.

Chemec has more than 25 years of experience in the manufacturing and supply of chemical solutions for industrial actors.

Provided by University of Eastern Finland

Citation: New method for efficient removal of uranium and other heavy metals from water (2013, December 11) retrieved 25 April 2024 from <https://phys.org/news/2013-12-method-efficient-uranium-heavy-metals.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.