Pulp friction cleans up 'Brockovich' chemical

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A byproduct of the manufacture of pulp using the sulfite process for making paper, sodium lignosulfonate, can be used to immobilize and soak up toxic chromium compounds from soil and water, according to research published in the *International Journal of Innovation and Sustainable Development*.

Konstantin Volchek and Carl Brown of Environment Canada, and Dario Velicogna of Velicogna Consultants Inc in Ottawa, have carried out two successful parallel tests of efficacy on a laboratory scale. The first involved removal of chromium ions from water using reagent binding and membrane separation and the second was the stabilization of chromium ions in the soil using chemical soil flushing. Lignosulfonates can bind hexavalent chromium and allow it to be removed from contaminated water by subsequent membrane filtration. The soil tests showed that lignosulfonates can reduce the mobility of chromium so that it becomes trapped within the soil matrix; in the field this would reduce the risk of it leaching from a contaminated site into the underlying water table or waterways.

Chromium has many uses in industry but its accidental and even deliberate release into the environment has led to widespread contamination of soil and water. However, chromium salts are also naturally present in rock and soil at relatively high concentration in certain parts of Greece, Italy and the USA. Chromium(III), which carry a 3+ electrical charge and chromium(VI) 6+ charge are the most stable and so the most common. Cr(III) is not very soluble and although it has some toxicity it is the highly soluble and so mobile Cr(VI) that is a

significant cause for environmental and health concerns. Cr(VI) ions are both toxic and cancer causing.

There are various technologies that might be used to extract chromium(VI) ions from contaminated soil or water. However, these usually require the addition of expensive chemicals to allow the heavy metal ions to be extracted or immobilized. A much more sustainable approach would be to use a reagent that was just as effective or more so and that was itself a waste product from industry. Sodium salts of lignosulfonates from the paper industry offer such an alternative, the researchers say.

"Inexpensive, effective and easy to use reagents that reduce chromium toxicity and mobility would make a remediation technology more attractive and competitive," Volchek and colleagues reports. The lignosulfonate first reduces toxic Cr(VI) ions to the less soluble and less hazardous Cr(III) and these bind strongly to the lignosulfonate molecules and can then be removed by membrane filtration.

More information: "Evaluation of sodium lignosulfonate for the remediation of chromium-contaminated soil and water" in *Int. J. Innovation and Sustainable Development*, 2013, 7, 289-302

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