Percolating a solution to hexavalent chromium

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The metal chromium is an essential nutrient for plant and animal metabolism, but it can accumulate to toxic and hazardous levels in the environment when discharged in industrial waste water; a point made infamous by the movie Erin Brockovich.

Chromium-contaminated wastewaters usually originate from dye and pigment manufacturing, wood preserving, electroplating and leather tanning. The element can exist in water as charged particles in one of two states, oxidation state 3+ (trivalent form) and 6+ (the hexavalent form usually exists as chromate or dichromate). Other oxidation states are possible but are unstable in water and revert to either 3+ or 6+.

The hexavalent form of chromium is the most toxic. There are various costly and not altogether effective methods of removing hexavalent chromium from wastewater; these include reduction and precipitation, adsorption on activated carbon, solvent extraction, freeze separation, reverse osmosis, ion exchange and electrolytic methods. Adsorption on to an inexpensive and readily available material that can be disposed of safely, or recycled, would be a more commercially viable alternative.

Thermal power station fly ash, algal and fungal biomass, and waste slurry from fertilizer plants have been investigated previously. Now, writing in the International Journal of Environment and Pollution, researchers at the Energy & Wetlands Research Group, in Bangalore, and Karnataka University, India, explain how coffee husks might offer an effective solution. They looked at the effects of pH, contact time, initial

concentration and adsorbent dosage on the adsorption of hexavalent chromium. Adsorption capacity is almost 50 milligrams per gram of coffee husk material. Reversing the process for analytical purposes revealed that they can retrieve about two-thirds of the adsorbed hexavalent chromium which can then be recycled.

The team points out that coffee husks are not only readily available but their use represents an economical and viable part of a wider waste-management strategy. The lack of protein in coffee husks means that they do not putrefy under moist conditions meaning the material would be safe in storage and during transportation.

More information: "Removal of hexavalent chromium using coffee husk" in *International Journal of Environment and Pollution*, 2010, 43, 106-116

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