Biochar as an innovative material for mercury treatment

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Mercury is a highly toxic element which can cause significant health problems to humans and is a cause of worldwide environmental contamination. Releases into the environment can be of both natural and anthropogenic origin, however anthropogenic use of mercury and related activities such as mining, fossil fuel combustion and incineration of waste materials enables long term transport of this pollutant. The toxicity of mercury is linked to chemical species, with methylmercury the most toxic and of particular concern to humans. This is due to biomagnififcation in the aquatic food chain, meaning fish consumption is a major source of mercury accumulation in humans. In 2013, the United Nations (UN) will launch a treaty that is aimed at tackling the very serious issue of mercury pollution. The development of new, innovative, treatment technologies is therefore imperative. Biochar, a carbon rich product similar to charcoal, that can be produced relatively easily through the pyrolysis of biomass may prove to be a viable alternative to activated carbon which is a much more expensive product. It has already been proven as an effective sorbent for organic compounds, although much less is known about inorganic contaminants. Recent studies have however found biochar to significantly reduce cadmium, zinc and arsenic concentrations in column leaching experiments. Biochar as an effective water treatment could provide low cost technology to developing countries with the added advantage of using green waste material and thus also providing a waste management solution. Therefore, the main aim of this study is to investigate the potential for biochar to be used as a low cost, sustainable remediation technique, for water contaminated with mercury. The experimental design involves a series of column experiments, with each column containing a different sorbent, different concentrations of mercury spiked water will be passed through and the eluent analysed for total mercury concentrations using Cold Vapour Atomic Fluorescence Spectroscopy (CVAFS). The adsorbent performance characteristics will be evaluated and the results presented in full.

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