

Cleaning Up Heavy Metals Using A Carbon Based Material

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(Slide 2) Coal is mined for energy production around the world. Various toxic elements such as heavy metals exist in coal refuse and fly ash, and can be released and enter the soil through coal industry activities. Large areas of post-mining lands need to be reclaimed upon closure. Land reclamation is the process of converting disturbed land to a beneficial end use. It usually involves removal of contaminants from water and soil. (Slide 3) Heavy metal contaminated soil and water pose a serious public health issue as accumulation in plants and animals is the main exposure pathway for human beings. Conventional methods of remediating heavy metals usually have high energy requirements and costs and low efficiency. Thus, there is a need to develop a cost effective and environmentally friendly approach for heavy metal removal.

(Slide 3) In my research, I am investigating the use of a carbon based material made from coal, called nano humus, to solve the problem. Nano humus is a dark black powder. It has many chemically reactive functional groups which could enhance metal adsorption. It works like a sponge that attaches and holds heavy metals, and thus reduces heavy metal uptake by plants. Nano humus is a cost effective material as the raw material it is made of can be found on coal mine sites at low cost.

(Slide 4) Our results showed that nano humus is a promising adsorbent for removal of metal ions and it is efficient and economical. At a high concentration, cadmium was rapidly removed during a short period of time. We found approximately 90 % of cadmium was removed after 15 minutes and 93% after 24 hours.

(Slide 5) The use of nano humus could help to reduce the cost of treating contaminants and reduce risks of heavy metals by removing them from the ecosystems. This will make more land available for humans to use for farming because we will have removed the metals. If we have more land available for farming then we are less likely to run out of food, meaning we have increased food security. As a land reclamation scientist, I work as an earth doctor and my research can help heal the earth from human activities and make a positive impact on the world we share to make it from this (picture of before) to this (picture of after).

