BIOCHAR: A COMPETITIVE CARBON BASED MATERIAL FOR LEAD REMOVAL FROM AQUEOUS SOLUTION

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Abstract: Heavy metal contaminants still present high-risk danger for human health. Although Environmental Protection Agency (EPA) requirements are being followed, the State of Mississippi keeps facing high levels of lead in drinking water. Higher levels are proven to be site specific and more likely to occur in older homes where plumbing systems are prone to corrosion, especially where drinking water has higher acidity or lower mineral content. Because of its high toxicity, exposure to lead can be harmful even at low levels, for that reason EPA has set the maximum contaminant level goal (MCLG) in drinking water to zero. For the majority of contaminants the maximum contaminant level (MCL) regulation based on the MCLG is being enforced, but because of the uncontrollable plumbing system corrosion, EPA has set a treatment technique for lead allowing a maximum concentration of 15 ppb. Many methods for lead removal have been researched, where adsorption attracts major interest for its economical and environmentally friendly advantages. Carbon based materials such as activated carbon (AC), carbon nanotubes (CNT) and biochar have been investigated by many researchers and proved to be efficient under certain testing conditions. Physical and chemical structure of carbon based materials makes them a favorable adsorbent where the specific surface area and high porosity is of great importance for high lead removal efficiency. In recent years, biochar has attracted a lot of interest due to its environmentally friendly properties, abundance of surface functional groups, high surface area, porosity and economical sustainability. All of the properties as well as the possibility to tailor its structure under different conditions (pyrolysis temperature, heating rate, etc.) gives biochar an instant advantage in regard to activated carbon and carbon nanotubes. High adsorption efficiency can be achieved without additional functionalization, which makes biochar a competitive carbon based material to already extensively researched AC and CNT. Biochar's adsorbent potential for lead removal shows a promising future for further process optimization as well for the preservation of human health.

Key words: Lead, adsorption, biochar, activated carbon, carbon nanotubes