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Adsorption of Lead From Aqueous Solution by a Novel Carbon Based Adsorbent

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Lead (Pb), due to its bioaccumulation ability, has been noted to have detrimental effects on the human body affecting the metabolism, blood and kidneys (Bansal and Goyal, 2005; Bowen, 1996). It is, therefore, imperative that lead be removed from water and wastewater to protect public health and aquatic lives. Multiwall carbon nanotubes (MWCNT) were reported by Li et al. (2003) to have metal sorption capacity of 3–4 times higher than those of powder and granular activated carbon. However, membrane clogging and separation of the nanomaterials from the filtrate pose a challenge. In this work, a novel composite material consisting of carbon nanotubes (CNT) and granular activated carbon (GAC) was synthesised to solve the filtration problem in a static filter. Various percentages of nickel (1%, 3%, 5 and 7%) were used as substrate catalyst during production of the adsorbent and these were linked to the morphology and adsorption capacity of the novel material in lead adsorption. Analyses showed that increased nickel content in the substrate from 1% to 7%, during adsorbent production, resulted in a rough surface of the CNT and increased lead removal from 24% to 89%. Equilibrium concentrations of lead for the adsorbents were achieved at about 60 minutes of contact time. The novel composite material has the potential to remove toxic materials from water and bring benefit to the society.

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New Glass Ionomer Cement With Boron

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The present invention relates to a new type of glass ionomer cement (GIC) in which boron has been incorporated as a main constituent. The new formula has resulted in superior physical and chemical properties, which make the glass ionomer an excellent dental restorative material in selected clinical situations. Some of the most important features of this type of cement offer are a coefficient of thermal expansion similar to that of a natural tooth structure, a chemical bond to enamel and dentin that reduce the need for retentive cavity preparation, a slow release of fluoride over a prolonged period of time and a capability to re-uptake the fluoride, as well as good biocompatibility with pulp tissue. The advantageous properties of these cements however will be further investigated to improve their strength and toughness to combat their brittle nature to enhance their resistance to wear, and to eliminate micro leakage that may occur at the interface.

The final outcome will be a patent for a new formula different from the conventional GIC. The new formula has proven to be a successful adjunct to restorative dentistry and hence will have a wide range of applications. It is usually composed of a powder of calcium alumino-silicate and an aqueous solution of poly acrylic acid. Via an acid base reaction, it forms hard white cement as a restorative material that possesses the desirable properties of the silicates and the poly-carboxylate cements.