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Heavy Metal pollution and its control through Non-conventional adsorbents (1998-2007): a review

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Contamination of water by toxic heavy metals has been a major environmental problem since long. Some of the past episodes of heavy metal contamination in the aquatic environment have increased the awareness about their toxicity. The outbreak of Minamata and Itai itai diseases in Japan; discovery of conversion of inorganic mercury into methyl mercury and its accumulation in human body through food chain, particularly, through fish and the carcinogenic nature of certain inorganics and metals have led to the refocusing of the attention of environmentalists on the abatement of heavy metal pollution. Heavy metals cause direct toxicity to humans and other living beings due to their presence in aquatic environment beyond the permissible limits. Some of these metals are bio-accumulative and detrimental to human health. Heavy metals when discharged in water bodies through wastes also affect the aquatic life and destroy their self-purification power. The sources and health effects of some widely used metals are given in Table 1. The direct discharge of heavy metal containing wastes into water bodies or sewers is to be checked in order to reduce the environmental impact.

The heavy metals have great affinity for sulphur and attack sulphur bonds in enzyme making them immobilized. They also bind to cell membrane and affect the transport processes through the cell wall. Mercury(II), Cadmium(II) and Lead(II) have been found to be effective enzyme inhibitors. Mercury in the form of methyl mercury is the most toxic species. It causes energy deficiency in brain cells and disorders in the transmission of nerve impulses(De, 1992).

The heavy metals even at relatively low concentrations are toxic to biological processes and thus prevent the effective degradation of organic wastes. Adenosine triphosphate, carbonic anhydrase, cytochrome oxidase are some of the key enzymes which help in the synthesis of heme, are inhibited by Pb(II)(De, 1992).Arsenic(III) compounds coagulate proteins. The enzymes that generate cellular energy in the citric acid cycle are adversely affected by As(III). The activity of the pyruvate dehydrogenase is inhibited since it forms a complex with As(III), which prevents the generation of ATP molecules(De, 1992).

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