

Effect of Metal Pollution & Removal of Metal by Adsorbent

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Abstract

Metal play an important role in our life. They are essential for Plant/Animal life at trace levels but they become toxic even at a little higher level. Six elements (O, C, H, N, P & S), which contribute almost 98% of the total mass of cell, but unfortunately metal also cause environmental pollution. This is the major concern, because like most organic pollutant can easily be destroyed by combustion has effected on metals. Out of 40 naturally occurring elements detected in living organism about 25 out of them essential for the animals and human beings. Metal like Pb, Hg, As etc. are necessary to human body in a minute quantities but even slight excess is very dangerous. Their proper emphasis has to be given to this fact as it is causing number of diseases to human & even cattle's metabolism. The conventional methods are useful but now a days various biotechnological based method are more effective & efficient^{1,2}.

Key words: Adsorbent; Heavy metals; Water; Industrial effluent.

Introduction

Metal plays an important role in our life. They are essential for Plant/Animal life at trace levels but they become toxic even at a little higher level. Six elements (O, C, H, N, P & S), which contribute almost 98% of the total mass of cell, but unfortunately metal also cause environmental pollution. This is the major concern, because like most organic pollutant can easily be destroyed by combustion has effected on metals. Out of 40 naturally occurring

elements detected in living organism about 25 out of them essential for the animals and humans. Metal like Pb, Hg, As etc. are necessary to human body in a minute quantities but even slight excess is very dangerous. Their proper emphasis has to be given to this fact as it is causing number of diseases to human & even cattle's metabolism. The conventional methods are useful but now a days various biotechnological based method are more effective & efficient.

Importance of Metal in Biological System:

| Elements | Composition by weight (%) | Elements | Composition by weight (%) |
|----------|---------------------------|-----------------------------------|---------------------------|
| O | 65 | Cu, Zn, Se, Mo, F, Cl, Ir, Co, Fe | 0.7 |
| C | 18 | | |
| H | 10 | | |
| N | 3 | | |
| Ca | 1.5 | Li, Sr, Al, Si, Pb, V, As, Br | 0.7 |
| P | 1.0 | | |
| K | 0.35 | | |
| S | 0.25 | | |
| Na | 0.15 | | |
| Mg | 0.05 | | |

Sources of Metals:

Air: The main sources of atmospheric metal pollution are.

- Mining smelting and refining of metal.
- Burning of fossil fuels.
- Vehicle Exhaust.

Water: Main source of water pollution are,

- Domestic sewage & Industrial effluents.
- Thermal power plants.

Soil: Main source of soil pollution are,

- Agriculture and animal wastes.
- Municipal & industrial sewage.
- Coal ashes, fertilizers, discarded goods.

Heavy Metals & Their Effects on Health:

| Heavy Metals | Sources | Health Effects |
|--------------|---|--|
| Lead | Mining coal, Automobiles, Paper Petrochemicals | Learning disability metal retardation nausea. |
| Cadmium | Coal, Nuclear & Coal power plants, Batteries, Ceramics, Toys | Itai Itai Disease, low level causes hypertension |
| Chromium | Leather thermal power plants, mining fertilizers, textile | Bronchial asthma, Allergies, Lung cancer |
| Nickel | Mining, Coal, power plants, Automobiles, Electroplating. | Dermatitis, Pneumonia. |
| Mercury | Mining, Paper & Pulp, Coal, Cement, Electrical EQPT, Pesticides. | Minamata disease |
| Zinc | Phosphate, Fertilizers, Distillery, Pharmaceuticals | Fever, Bone disorder. |
| Arsenic | Coal burning, Processing of sulphide ores. | Gastro intestinal, disorders, skin cancer, skin disorder. |
| Berellium | Coal burning, Nuclear fuel processing, Rocket fuel. | Long exposure at low level causes lung damage. |



An area of Karabache, Russia, where soil has been poisoned by high concentrations of lead, arsenic, nickel, cobalt, & cadmium

RECENT METHOD FOR REMOVAL OF METAL

Reverse Osmosis, Electro dialysis, Ultra filtration, Ion-exchange, Chemical Precipitation, Phytoremediation. Hence the disadvantages like incomplete metal removal, high reagent and energy requirements, generation of toxic sludge or other waste products that require careful disposal has made it imperative for a cost-effective treatment method that is capable of removing heavy metals from aqueous effluents.

MODERN METHOD

The search for new technologies involving the removal of toxic metals from wastewaters, based on metal binding capacities of various biological materials^{3,4}. The major advantages of adsorption over conventional treatment methods include.

- Low cost;

- High efficiency;
- Minimization of chemical and biological sludge;
- No additional nutrient requirement;
- Possibility of metal recovery.

They are using various agricultural products and by-products for the removal of heavy metal. Many researchers have investigated the efficiency of number of different organic waste materials as sorbents for heavy metals^{5,6}. Activated carbon adsorption appears to be a particularly competitive and effective process for the removal of heavy metals at trace quantities. The native exchange capacity and general sorption characteristics of these materials derive from their constituent polymers, cellulose, hemicelluloses, pectin, lignin, and protein have been proposed the utilization of biomaterials or abandoned biomaterials (BIOM). The idea of using various agricultural products and by-products for the removal of heavy metal from solution has been investigated by number of authors. Apart from that there is need of sustainable concept & application of 3 R Policies to reduce metal pollution & its effect on environment.

Conclusion

This aspect needs to be investigated further in order to promote large-scale use of non-conventional adsorbents. In spite of the scarcity of consistent cost information, the widespread uses of low-cost adsorbents in industries for wastewater treatment applications today are strongly recommended due to their local availability, technical feasibility, engineering applicability, and cost effectiveness. The low-

cost adsorbents perform well in removing heavy metals. They can be adopted and widely used in industries not only to minimize cost but also improve profitability. In addition, if the alternative adsorbents mentioned previously are found highly efficient for heavy metal removal, not only the industries, but the living organisms and the surrounding environment will be also benefited from the decrease or elimination of potential toxicity due to the heavy metal.

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