Chapter 4

Biosorption of Uranium Heavy Metals:
Technology and Methods

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ABSTRACT

Uranium is a seriously threatening heavy metal because of its high toxicity and radioactivity. Uranium contaminates surface and groundwater. Metal removed from aqueous solutions often leads to effective metal concentration. Apart from the slow natural process of metal mineralization, removal of heavy metals is attained when the metal becomes concentrated at a point that it is either returned to the process or resold. Physical adsorption takes place due to van-der Waals' forces. Conventional methods used for uranium removal are expensive and produce huge amount of sludge (consists of toxic substances) which blockade the membrane. In this chapter, uranium removal by biosorption method is discussed. Uranium removal is attained by the use of either living microorganisms (bacteria, algae, and fungi) or their dead biomasses.

INTRODUCTION

The heavy metal pollution and their most serious environmental problems have drawn more attention. Due to rapid industrialization and economic development a number of industries like mining, surface finishing, energy and fuel producing, fertilizer, pesticide, metallurgy, electroplating, electrolysis, electro osmosis, leather, iron and steel photography, electric appliance manufacturing, metal surface treating, aerospace and atomic energy installations have been established. The wastes from these industries contain metals are directly or indirectly discharged into the environment which causing serious environmental pollution and even threatening human life. Apart from waste various metals including uranium also contributed from the natural sources. Uranium is naturally occurred heavy metal. It is found in various chemical forms in all types of soils, rocks, seas and oceans. It is also found in drinking water and some of the foods. Uranium (atomic number 92) is the heaviest known natural element with specific density of $18.7 \, g/cm^3$ and is slightly radioactive. Uranium is about forty times more common than silver. Uranium occurs naturally in the +2, +3, +4, +5 and +6 valence states. The hexavalent is most common form of Uranium. World health organization (WHO, 2001) reports that approximately 90 micrograms an average of Uranium present in the human body through drinking water, food and air. It is supposed to be found in the skeleton (66%), in liver (16%), in kidneys (8%) and in other body tissues (10%). Apart from natural resources there are various other sources of exposure are mining and milling, metal, combustion, corrosion and nuclear waste. The atomic reactors are rich in the source of uranium and other radioactive materials. There major problem resides in their disposal. In lack of appropriately disposal, they can harm not only living organisms but also the human being.

ROUTE OF EXPOSURE

There are various route of exposure of uranium particularly inhalation, ingestion and dermal contact.

1. **Inhalation:** Inhalation is the most common route of route exposure take place when depleted uranium is re-suspended in the atmosphere through wind or other disturbances.
2. **Ingestion:** Ingestion may occur during the uranium contamination in drinking-water or food.
3. **Dermal contact:** Uranium is able to passes the skin and enter into the blood stream and further it could be deposited in the body organs.

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