Chapter 7
Technological Interventions in Management of Hg Contaminated Water

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ABSTRACT

Rising cases of environmental mercury hazards has led to a need for cost-effective mercury treatment techniques. Extensive use of mercury from ancient times has resulted in water contamination that may require remediation. Mercury contamination is tedious to treat and may pose a risk to human health and the environment. To deal with this threat of mercury contamination, industrial wastes and wastewaters containing mercury requires treatment for its removal and immobilization. This chapter provides a synopsis of the availability, performance, and technologies for management of mercury in water. It covers the innovative methods to treat the mercury contamination like biosorption. In this chapter, the technological aspects available for the mercury treatment technologies are reviewed. It describes the theory, design, and operation of the technologies; provides information on commercial availability and use; and includes data on performance, where available.

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INTRODUCTION

Heavy metal toxicity is the major environmental issue known in the emerging trends of life. Majority of the heavy metal ions are highly unsafe to living organisms and these metal ions are non-degradable but are also available in the nature in large quantity. Therefore, the removal of heavy metal ions from the contaminated wastewater is important to protect the environment and to reduce the public risk. Generally, industrial effluents/wastes are vital cause of heavy metal concentration, the activities like corrosion of water pipes, electroplating, electrolysis, electro-osmosis, mining, dumping of waste, surface finishing, energy and fuel production, metal surface treatments and atomic energy installations etc. Therefore, the elimination and recovery of the heavy metals from effluent streams are essential for the protection of the environment (Wang & Chen, 2009). Various methods comprise physical, chemical and biological technologies are involved in removing metal ions from the aqueous solutions. Conventional methods like chemical precipitation, lime coagulation, solvent extraction, membrane filtration, reverse osmosis, ion exchange and adsorption, are generally being used for the reduction of heavy metal ions from the aqueous wastes. However, each process has its own advantages and limitations in application, so these traditional metal removal methods have major disadvantage like incomplete metal removal, high reagent and energy requirements, generation of toxic sludge or other waste products. Moreover these methods are often ineffective or uneconomical at large scale process (Dzionek, Wojcieszyńska & Guzik, 2016). In recent years, microbial biomass has unfold as an option for developing economic and eco-friendly wastewater treatment process in controlling and removing metal pollution in the field of biotechnology and gradually preferred to control metal pollution due to its potential efficacy. The process is known as biosorption, which utilizes various certain natural materials of biological origin, including bacteria, fungi, yeast, algae, etc. (Wang & Chen, 2009).

Biosorption is a vast and hasty phenomenon of passive metal sequestration by the non-growing biomass/adsorbents. It has advantages compared with conventional techniques, in which microorganisms are used to eliminate and recover heavy metals from aqueous solutions, have been known for few decades (Kratochvil & Volesky, 1998; Mahbub et al., 2017). Biotechnological emerging trends and recent techniques can succeed in these areas and are designed to cover such niches. Microorganisms like fungi have demonstrated its capability to take up heavy metals like mercury from aqueous solutions, especially in different ranges of metal concentrations in the effluent (Wang & Chen, 2006). Besides versatility, selectivity to remove only the desired metals and the cost-effectiveness are some added merits of biological metal cleanup techniques. These factors have upgraded extensive research methodology on the biological interventions of heavy metal elimination. This chapter reviews

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