PREFACE

The phenomenon of adsorption also known as surface phenomenon has been known since 1773 when Scheel discovered the uptake of gases by charcoal. The importance of this simple phenomenon can be assessed as Langmuir was awarded the 1932 chemistry Nobel Prize for his contribution to surface chemistry. Roudolf A. Marcus, Professor of chemistry at the California Institute of Technology in Pasadena (USA), was awarded Nobel Prize for chemistry in 1992 for his theories explaining the electron-transfer reactions in chemical reactions. Gerhard Ertl was awarded Nobel Prize in 2007 for his contribution to surface chemistry.

Carbon adsorption has become customary in the food processing, however, it is not economical. Extensive research has, therefore, been directed towards investigating potential substitutes for commercial activated carbon which might have the advantage of an effective, lower-cost replacement for existing bone char or coal base granular activated carbon (GAC).

Water is one of the most significant chemicals of our surrounding and essential for human survival. Safe and readily available water is important for human life; it is used for drinking, household activities, domestic use, agricultural, industrial, food production or recreational purposes.

Heavy metal contamination is the greatest concern among all kinds of environmental pollution because they are highly toxic and transportable. The presence of toxic metals in ground water sources is an important topic of wastewater treatment because their consequences on human health have been well established.Various industries such as electroplating, metal-processing, paint, plastics alloy, batteries, ammunition and the ceramic glass industries, etc. generate large quantities of contaminated water containing various types of heavy metals.

World Health Organization (WHO, 2000) has reported that metal ions of immediate concern are aluminium (Al), arsenic (As), lead (Pb), cadmium (Cd), mercury (Hg), barium (Ba), beryllium (Be), antimony (Sb), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), manganese (Mn), nickel (Ni), palladium (Pd), selenium (Se), tellurium (Te), tin (Sn) and zinc (Zn). Among these metal ions, copper, iron, zinc and trivalent chromium are essential to human body at trace levels. However, most of them are highly poisonous and hazardous particularly, arsenic, lead, cadmium and mercury compounds to human and ecosystem.

Among a range of heavy metal ions as arsenic (V), lead (II), cadmium (II) and mercury (II) have gained considerable attention of researchers due to their adverse effects on the environment, their solubility over a wide range of pH, human health and their presence in several industrial wastewaters. These ions with higher concentrations in certain areas are very dangerous for human as well as for the environment.

The domain of the present work is to study adsorptive removal of As(V), Pb(II), Cd(II) and Hg(II) ions from water/ wastewater contaminants employing new generation adsorbents. Attempt has been made to develop methods for the removal of As(V), Pb(II), Cd(II) and Hg(II) ions employing low cost adsorbents derived from agro-waste materials.