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**Advances in
Nanotechnology and
its Applications**

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ADVANCES IN NANOTECHNOLOGY & ITS APPLICATION

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CHAPTER 7

Activation of Oil Palm Empty Fruit Bunches into Activated Carbon for Removal of Zinc: Optimization by Full Factorial Design

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Introduction

Heavy metals are common in industrial applications such as manufacturing of batteries, alloys, electroplated metal parts, steel as well as wastewater treatment plants (Jesús et al. 2008; Alam et al. 2003). Heavy metal toxicity can result in damaged or reduced mental and central nervous function, lower energy levels, and damage to blood composition, lungs, kidneys, liver, and other vital organs (IOSHIC, 1999). In Malaysia, Indah Water Konsortium (IWK), a national sewerage company, generated large volume of sludge that contains high content of Zn due to disposal of toiletries. Therefore, removal of Zn from wastewater sludge is necessary before its discharge to water bodies.

Various treatment technologies have been developed for the purification of water and wastewater contaminated by heavy metals. The most commonly used methods for removal of metal ions from industrial effluents include chemical precipitation, oxidation-reduction, reverse osmosis, ion exchange, evaporation, dilution, adsorption, filtration etc. Among these, adsorption has evolved as the front line of defense especially those could not be removed by other techniques (Mohan and Singh, 2001). One of the methods of adsorption is by using activated carbon for the removal of metals from aqueous solution. A variety of activated carbon available commercially but a few of them is selective for heavy metals removal and