

CHAPTER 1

INTRODUCTION



1.1 Motivation

Heavy metal compounds are one of the most significant culprits in the wastewater problem. They are mainly derived from heavy industry such as electroplating factories. The treatment of this type of wastewater involves high cost techniques such as ion exchange, evaporation, precipitation, membrane separation etc. Unfortunately, these common techniques have been shown to be quite expensive for wastewater containing low concentration of heavy metals (Banerjee, 2000). Biosorption using algae as a biosorbent has lately been introduced as an alternative, low cost, process for such treatment (Volesky, 1990). Most of the study on the heavy metal biosorption focused only on one type of heavy metal. In actual applications, however, it is likely to encounter wastes containing a mixture of heavy metals. Hence, the investigation on the competitive sorption is important and should be given special attention.

Caulerpa lentillifera is a marine macroalga commonly found in marine culture ponds. This specific alga is known to uptake and keeps the balance of nitrogen compounds in the culture ponds (Chokwiwattanawanit, 2000). However, its rapid growth necessitates a regular removal of the excess quantity. Hence, there is a need for the management of this overabundance of the algal mass. Previous work (Sungkhum, 2003) focussed on turning this unwanted algal mass into biosorbent for the sorption of heavy metal ions from aqueous solution for a single solute system, and it was shown that this dry alga could be employed for sorption of Cu, Cd, Pb and Zn.

This work intends to extend the work on the adsorption using *Caulerpa lentillifera* by focusing particularly on the investigation of competitive sorption of *Caulerpa lentillifera* with multi-component mixtures aqueous of copper (II), cadmium (II), lead (II), and zinc (II).

1.2 Objective

To study the efficiency for the biosorption of multi-component heavy metal by *Caulerpa lentillifera*.

1.3 Hypothesis

There is a competition to algae's sorption sites by various heavy metals.

1.4 Scopes of this work

- 1.4.1 Biosorption of Cu, Cd, Pb, and Zn by *Caulerpa lentillifera* in single solute, binary solute, ternary solute and four-component solute systems were investigated. These metals were used as representatives for electroplating wastewater.
- 1.4.2 The experiment was conducted with synthetic heavy metal solution and the range of concentration of each heavy metal was 0 - 100 mg/l.
- 1.4.3 The experiment is only performed in a batch mode.

1.5 Benefits from this work

This research illustrates the feasibility in using *Caulerpa lentillifera* in synthetic wastewater application with a mixture of heavy metal ions. The results from this research facilitate the understanding of the sorption behavior for the multi-component heavy metals system and lead to a better design of the adsorption system for the actual wastewater application.