CHAPTER 1

INTRODUCTION

Textile industries are a big group of industries, they consist of man-made fiber mills, spinning mills, weaving mills, knitting mills, dyeing and printing mills, and clothing mills. These industries play an importance role in Thai economics as data of textile and clothing exports in year 2001, the value was 235,190 million baht and covered 8.1% of total exports (2,893,177 million baht). Survey in number of textile mills was found that Thailand has 4,544 factories of textile in year 2001 (Textile Industry Division, 2002) excluding several unregistered small textile mills dispersing in all parts of Thailand.

Industrial processes are a manufacturing of constant quality and high quantity that have to use raw materials and several resources including energy in large amount resulting waste products. In the same way, textile processes especially wet processing such as desizing, scouring, bleaching, dyeing, printing, and finishing, they use large amount of water and chemicals (Banat *et al.*, 1996) resulting wastewater contaminated with organic substances (such as flow and fiber) and chemicals (such as surfactants, oxidizing agent, and dyes). These wastes are origins of environmental problems and necessary to remediate them to acceptable condition before releasing to natural aquatic ecosystems.

First major problem of textile wastewater is dark color resulting a visual pollution. Dyeing is processed in several textile mills such as fiber dyeing, fabric dyeing and printing, cloths dyeing and printing, and especially dyeing and printing factories. Because dyes can not bind on textile surface completely, dyes are lost in wastewater about 5-20% during the process (Soares *et al.*, 2001; Wong and Yu, 1999). In Thailand, Textile Industry Division (2002) reported that dyes was imported 5,254.1 tons in year 2001 indicated high consumption of dyes in Thailand.

By dye structure, the most popular dyes used are azo group used up to 60-70% of all dye types (Fu and Viraraghavan, 2001; van der Zee *et al.*, 2001) followed by anthraquinone and indigoid group (Wang and Yu, 1998). Not only textile industries, but also industries of plastics, leather, paper printing, photogravure, petroleum products and etc. are associated with dyes (Pointing, 2001; Eskilsson *et al.*, 2002; Jarosz-Wilkolazka *et al.*, 2002). Further more, not only dye using industries but also dye producing industries are another sources of dye contamination in water (Reddy and Mathew, 2001).

Methods of dye contaminated wastewater treatment can be divided in three way as follow: physical treatments (such as adsorption and membrane filtration), chemical treatments (such as chemical coagulation and chemical oxidation), and biological treatments. Physical and chemical treatments use large amount of materials and chemicals resulting high operative cost, some methods produce hazardous sludge resulting a disposal problem. In biological treatments, conventional treatments such as activated sludge systems can not give a satisfaction of dye removal because complex structure of dyes hard to degrade by general microorganisms (Jarosz-Wilkolazka *et al.*, 2002). If anaerobic treatments were used, they can only remove azo dyes by activity of azo reductase and produce toxic by-products, aromatic amine (Novotny *et al.*, 2001; Kapdan and Kargi, 2002).

Interested alternative way is dyes removal by white rot fungi. These microorganisms can well degrade natural lignin. Lignin is a second largest amount of biomolecule following to cellulose and it is a recalcitrant polymer. However, ligninolytic enzymes of white rot fungi can degrade this polymer and the enzymes which are non-specific to their substrates can be applied to degrade other organic molecules such as pesticides, TNT (trinitrotoluene), PCBs (polychlorinated biphenyls), PAH (polyaromatic hydrocarbon), and dyes. *Coriolus versicolor*, *Phanerocheate chrysosporium*, *Pleurotus ostreatus* and so on are reported high ability in dye decolorization. In nature, these white roi fungi use the ligninolytic enzymes in lignin degradation. Many dyes can also be degraded by these enzymes for use in their carbon and nitrogen sources (Swamy and Ramsay, 1999) resulting a decreasing of toxic substances (Chen, 2002), so white rot fungi are an interested alternative way and possible to develop in large scale treatment.

Objectives of this study

1. To characterize in batch decolorization of azo dye by *Coriolus versicolor* RC3 in various conditions.
2. To study of the immobilization of *C. versicolor* RC3 on polyurethane foam.
3. To investigate for continuous decolorization in packed bed bioreactor.