CHAPTER I
INTRODUCTION

The concept of using magnetic nanoparticles (MAG) as materials in advanced application such as drug delivery system, contrast agent for MRI, hyperthermia treatment and separation purpose such as DNA/ RNA separation gains much interest for the past decade. The studies of magnetic nanoparticles rapidly grow due to the their properties such as ultrafine size, biocompatibility, functional group availability for further chemical modification, and most important characteristic property, responsiveness to external magnetic field or so called superparamagnetic properties. However, due to its small particle size, uncoated MAG tend to aggregate in aqueous system. In order to stabilize the colloidal dispersion, several studies about the surfactant adsorption on the surfaces of MAG were proposed. Polymeric materials, surfactant, or fatty acid were also used to stabilize MAG.

It is important to note that in modifying MAG for those advanced applications, effective coating materials and methods have to be considered. Although there are several studies tried to incorporate MAG with other materials, the binding mechanism is still not well-clarified.

The present dissertation is focus on the development of magnetic chitosan hybrid materials both by secondary forces and covalent band. For secondary forces, chitosan nanosphere is used to hybridize with MAG. The work covers simple preparation method, demonstrating factors related to colloidal phenomena. The work also extends to study its potential application as a bacterial DNA extraction material. The work on covalent bond formation between chitosan and MAG demonstrates the ease of chemical reaction between silane-coated MAG and chitin/chitosan. The obtained covalently bound materials are challenged to form a strong connection even in an extreme environment.