CHAPTER I

INTRODUCTION

Numerous studies have been done in the colloid field because of the increasing importance of colloid particles in various applications such as : paint formulation[1], coating[2], mineral process[3], and wastewater treatment[4]. Moreover, there are many works concerning in colloid field such as the theory of phase dispersion and aggregate stability of colloid[5], the effective stabilizer which is block or graft copolymer[6], especially the adsorption of polymer or amphiphile (surfactant) on the particle being actively investigated; for example, the adsorption of high molecular weight polyacrylamide from aqueous solution on siliceous mineral[7]. Colloidal phenomena in both aqueous and nonaqueous systems have been widely studied such as the adsorption of polystyrene on silica in cyclohexane or in carbon tetrachloride[8]. Silica particles are one of the most common colloidal particles. It is widely used in many fields; for examples, it can be used as a catalyst support in oil refineries. It is also the important material in producing glass and ceramic; therefore, there is no wonder why silica particles are extremely studied. The stability of aqueous silica sols have been studied[9]. Silica sols can be controlled by adjusting pH and electrolyte solution. The interaction between surfactant/polymer with silica was explored[10, 11, 12, 13].

Stabilization of silica particle using polymer (Polyacrylamide) and surfactant Cetyl trimethyl ammonium bromide (CTAB) in aqueous system was shown in this study. Electrostatic repulsion of silica particles was reduced by increasing the concentration of electrolyte solution. Polyacrylamide, CTAB, and TMAB were chosen in this study because they were soluble in aqueous solutions and, especially, CTAB and TMAB were a cationic surfactant that would easily adsorb on the negatively charged silica surfaces. Surfactant could be either stabilizer or flocculater that induced the coagulation of colloidal particle depending on the amount of amphiphile on

the particle surface. When the silica particles were completely surrounded with polymer and amphiphile, they were dispersed in the solution due to the steric effect from the adsorbed molecules. In case of the surface was partially covered, the adsorbed molecule induced the particle flocculation by forming micelle. Its detail would be given later in this study.

The flocculation, coagulation, and de-flocculation of silica particles in aqueous systems were focused in this study. Various parameters were studied including the effect of salt, type of stabilizer, and length. Most of the results were the measurement of the floc size at different conditions. In this study, the floc size of silica particle in aqueous systems were controlled by adding surfactant and polymer in orthokinetic experiment. In a related work, B.H. Bijsterbosch[14] measured the adsorption isotherm in the system of CTAB and silica particles. It was found that CTAB formed bilayers at the surface of silica particles when the concentration of CTAB was sufficiently high[15]. The aggregation number of micelle, the hydrodynamic thickness, and surface density of the adsorbed layer were studied in scaling model[16]. Perferkorn paper shows the studies of polymer adsorbed on the silica particles which explain the distribution of the latex particles in several conditions[17,18].