CHAPTER I
INTRODUCTION

Soap is one of the surface active materials and has been used for thousands of years ago. Nowadays, soap continues to use in dominant body cleaning and sill some extent in laundry product (Lange, 1999). Soap has both property a hydrophobic tail and a hydrophilic head group. The hydrophilic portion of soap molecule is the carboxylate head group and the hydrophobic portion is the aliphatic chain. Therefore, soap is simultaneously soluble in both aqueous and organic phase. From its chemical structure, soap leads to the ability of surfactants to clean dirt and oil from surface by forming micelle (Bartolo *et al.*, 1997).

Although Soap is good detergent, Soap forms notorious the water-insoluble complexes with water hardness ions which are calcium and magnesium ions. Calcium and magnesium salt of long chain fatty acid or also known as soap scum is generated in hard water containing large amounts of Ca and Mg ions which is a typical molar ratio 4:1 (Dissanayake and Chandrajith, 2009). The formation of soap scum effectively removes the surfactant from solution and leads to precipitate on the surface of sink and bathtubs as a white sticky stain, unsightly and difficult to remove. This problem motivated the chemical industry to develop cleaning product.

Normally, hard surface cleaner consists of surfactant, organic solvent and chelating agent. To achieve good cleaning, good formulation is require for removing soap scum rapidly and using less mechanical force. Soap scum gave the highest dissolved at high pH solution with dimethyldodecylamine oxide (DDAO) which is amphoteric surfactant in synergism between chelating agent (disodium ethylenediamine- tetraaceate, Na_2EDTA) binding calcium and surfactant forming mixed micelle well (Soontravanich *et al.*, 2010). Moreover, this condition gives the highest solubility on both calcium and magnesium soap scum (Itsadanont *et al.*, 2013). However, Na_2EDTA is toxic for aquatic life and low biodegradable in environment. So, it should to replace this chelating agent. Tetrasodium salt of N,N-bis (carboxymethyl) glutamic acid (Na_4GLDA) is considered as a readily biodegradable and produced from natural raw material. The Na_4GLDA biodegradable chelating agent showed the higher solubility of calcium soap scum

than the Na_2EDTA conventional chelating agent. The Na_4GLDA give the highest soap scum dissolution at pH 11 and constant temperature at 25°C (Theptat *et al.*, 2013).

In the present work, soap scums were synthesized from stearic acid and commercial soap and with water containing with pure calcium, pure magnesium, mixed Ca and Mg at a molar ratio of Ca:Mg = 4:1 and natural hard water. The equilibrium solubilities of synthesized soap scums were study in various optimum conditions from previous work (Itsadanont *et al.*, 2014) including pure water at pH 4, (DDAO) amphoteric surfactant with Na_2EDTA and Na_4GLDA chelating agent systems at constant pH 11 at 25°C. The synthesized soap scums were also characterized for the physical properties including particle size, surface morphology and functional groups.