CHAPTER I
INTRODUCTION

The formation of soap scum results from our daily routine activities e.g. taking a shower. When personal care products, especially soap, is exposed to hard water containing alkaline earth divalent cations, especially Ca(II) and Mg(II), soap scum is generated to stain on the surfaces of toilet tiles and sinks (Park *et al.*, 2007). In addition, for a long period of time it becomes more difficult to be removed and the white stain is changed into yellow and black because of the growth of mold and bacteria on the soap scum stain.

Nowadays, there are no any effective cleaning products for removing soap scum stains. Soontravanich et al. (2010) carried out a first attempt to study the effects of surfactant types, solution pH and the presence of EDTA chelating agent on soap scum dissolution. Unfortunately, the proposed formulation is using a non-biodegradable chelating agent, EDTA (ethylene diamine tetraacetic acid), that can be harmful to plant, soil and aquatic microorganisms and can also persist in the environment because of the low biodegradability (Luo *et al.*, 2006). Furthermore, at high concentrations, it is toxic to bacteria and mammals due to chelation of metals in an outer membrane or ingestion changes excretion of metals that can affect cell membrane permeability as well (Hancock, 1984). Hence, in many developed countries, especially in Western Europe, application of the substances including chelating agents is restricted (Kolodyńska, 2011).

Therefore, the use of biodegradable chelating agents to replace EDTA is of great interest. One of the most promising biodegradable chelating agents is EDDS, ethylene diamine dissuccinate, which is a structural isomer of EDTA. Only the (S,S) isomer is of interest and should not be confused with the other stereo-isomers of EDDS (RR-, RS-, SR-) where they are non-biodegradable or partly biodegradable (Schowanek *et al.*, 1997). In addition, a tetrasodium salt of N,N-bis(carboxymethyl) glutamic acid (GLDA), marketed as Dissolvine GL-38, is a direct alternative to EDTA as well (Schneider et al, 1999). According to the Swedish Society for Nature Conservation, GLDA is 86% based on renewable resources because it is produced from flavor enhancer monosodium glutamate (MSG). Hence, GLDA is classified as

readily biodegradable according to the internationally recognized OECD 301D test and is the only chelating agent that contains green carbon atoms contrary to the production of EDTA whose carbon content is based on fossil. However, only GLDA in L-form is concerned with Dissolvine GL-38 because the D-form is biodegradable.

The main objective of this study is to investigate the dissolution of soap scum by using biodegradable as an alternative for EDTA in different types of surfactant and soap scum models at various solution pH and a constant temperature at 25°C.