

**DISSOLUTION KINETICS OF MIXED SOAP SCUMS AT DIFFERENT
MOLAR RATIOS OF Ca AND Mg IN AN AMPHOTERIC SURFACTANT
SYSTEM WITH DIFFERENT CHELATING AGENTS**

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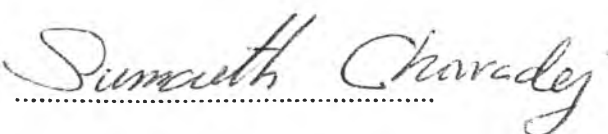
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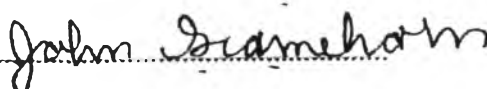
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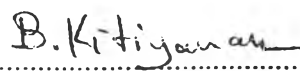
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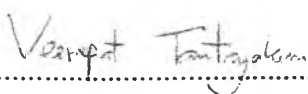

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ABSTRACT

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Rumpapat Siripaisan: Dissolution Kinetics of Mixed Soap Scums at Different Molar Ratios of Ca and Mg in an Amphoteric Surfactant System with Different Chelating Agents.

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Hard water generally contains divalent cations, especially calcium and magnesium ions, which have a typical molar ratio of 4:1. Soap or salt of fatty acid reacts with Ca and Mg ions, to form white precipitate known as soap scum. It is a sticky stain or filmy layer that can form on sanitary ware. In this work, the equilibrium solubility and dissolution rate of synthesized soap scum samples at different Ca:Mg molar ratios (1:1 and 4:1) in different systems (pure water, disodiumethylene diaminetetraacetate (Na_2EDTA), tetrasodium glutamatediacetate (Na_4GLDA), dimethyldodecylamine oxide (DDAO), DDAO/ Na_2EDTA , and DDAO/ Na_4GLDA) were investigated at different solution pH levels (4-11) and at a constant temperature of 25 °C. The results showed that the DDAO/ Na_4GLDA system provided the highest equilibrium solubility of the mixed soap scum, whereas the DDAO/ Na_2EDTA system provided the highest dissolution rate of any mixed soap scum at pH 11. For the 1:1 ratio, the equilibrium solubilities of the calcium and magnesium soap scum samples were not significantly different. For the 4:1 ratio, the equilibrium solubility of calcium soap scum was higher than that of the magnesium soap scums. The synthesized mixed soap scum samples were also characterized for particle size distribution, surface morphology, crystalline size, specific surface area, and functional groups.

บทคัดย่อ

รัมภาภัทร ศิริไพศาล : การศึกษาสมมูลการละลายและอัตราการละลายของคราบโคลสบู่ในอัตราส่วนต่างๆ ภายใต้สภาวะที่มีสารลดแรงตึงผิว (DDAO) และสารคีแลนท์ชนิดต่างๆ (Na_2EDTA and Na_4GLDA) (Dissolution Kinetics of Mixed Soap Scums at Different Molar Ratios of Ca and Mg in an Amphoteric Surfactant System with Different Chelating Agents) อ.ที่ปรึกษา : ศ.ดร.สุเมธ ชวเดช และ ศ.ดร. จอห์น เอฟ สกามีฮอร์น 61 หน้า

น้ำกระด้างเป็นน้ำที่มีไอออนของธาตุต่างๆ ละลายอยู่โดยเฉพาะแคลเซียมและแมกนีเซียมไอออน โดยมีสัดส่วนแคลเซียมต่อแมกนีเซียมตามธรรมชาติเป็น 4:1 เมื่อสบู่ละลายน้ำกรดไขมันจะทำปฏิกิริยากับแคลเซียมและแมกนีเซียมไอออนเกิดเป็นคราบโคลสบู่ที่ติดอยู่ตามสุขภัณฑ์ในห้องน้ำ วัตถุประสงค์ของงานวิจัยนี้ เพื่อศึกษาสมมูลการละลายและอัตราการละลายของคราบโคลสบู่ในอัตราส่วนแคลเซียมต่อแมกนีเซียม 1:1 และ 4:1 ภายใต้สภาวะที่มีสารลดแรงตึงผิวและสารคีแลนท์ชนิดต่างๆ จากการทดลองพบว่าค่าสมมูลการละลายของคราบโคลสบู่ทั้งสองสัดส่วนมีค่าสูงที่สุดเมื่ออยู่ในสภาวะที่มีสารลดแรงตึงผิวโดเมธิลโคเดกซิลลามีน ออกไซด์ (DDAO) ที่มีสารคีแลนท์เทตระโซเดียมกลูตาเมทไดอะซีติกแอซิด (Na_4GLDA) ที่พีเอช 11 ในขณะที่อัตราการละลายของคราบโคลสบู่ทั้งสองสัดส่วนมีค่าสูงที่สุดเมื่ออยู่ในสภาวะที่มีสารลดแรงตึงผิวโดเมธิลโคเดกซิลลามีน ออกไซด์ (DDAO) ที่มีสารคีแลนท์ไดโซเดียมเอทิลีนไดเอมีนเตตระอะซีเตต (Na_2EDTA)

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ABBREVIATIONS

AAS	Atomic absorption spectrometer
Ca(C ₁₈) ₂	Calcium stearate or calcium soap scum
CMC	Critical micelle concentration
DDAO	Dimethyldodecylamine oxide
FT-IR	Fourier transform infrared spectroscopy
HCl	Hydrochloric acid
H ₂ O	Deionized water
K _{sp}	Solubility constant
Mg(C ₁₈) ₂	Magnesium stearate or magnesium soap scum
NaOH	Sodium hydroxide
Na ₂ EDTA	Disodium salt of ethylenediaminetetraacetate
Na ₄ GLDA	Tetrasodium salt of N,N-bis(carboxymethyl) glutamic acid
PSA	Particle size analysis
SEM	Scanning electron microscope
XRD	X-ray diffractometer