

**INVESTIGATION OF BARIUM SULFATE DEPOSITION
BY CAPILLARY FLOW
AND
THERMAL EFFECT ON SILICA PRECIPITATION IN ACIDIC SOLUTION**



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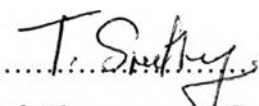
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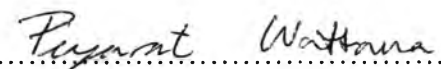

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บทคัดย่อ

สาริณี ยินดี: การศึกษากลไกการเกาะติดของแบเรียมซัลเฟตด้วยเทคนิคการไหลผ่านท่อแคปิลลารี (Investigation of Barium Sulfate Deposition by Capillary Flow) และ การศึกษาอิทธิพลของอุณหภูมิที่มีผลต่อการตกตะกอนซิลิกอนในสารละลายกรด (Thermal Effect on Silica Precipitation in Acidic Solution) อ. ที่ปรึกษา: ศ. เศษ สกอตต์ ฟอกเลอร์, ผศ.ดร. ปมทอง มาลากุล ณ อยุธยา 52 หน้า

ตะกอนที่ประกอบด้วยแบเรียมซัลเฟตเป็นปัญหาหนึ่งที่ยุ่งยาก รุนแรงและพบมากในกระบวนการผลิตน้ำมัน เนื่องจากค่าการละลายของแบเรียมซัลเฟตที่ต่ำมาก ในงานวิจัยนี้มุ่งเน้นการพัฒนาเทคนิคเพื่อศึกษาการเกาะติดของแบเรียมซัลเฟตบนท่อแคปิลลารี ซึ่งเทคนิคการไหลผ่านท่อแคปิลลารีได้รับการพัฒนาให้เป็นเทคนิคที่มีศักยภาพสำหรับทำการทดลองการเกาะติดของตะกอน ดังนั้นการศึกษานี้จึงใช้เทคนิคนี้จึงถูกใช้ในการศึกษากลไกการเกาะติดของตะกอน ด้วยการติดตามการเปลี่ยนแปลงของผลต่างความดัน ปริมาณตะกอนที่เกาะติดสามารถทราบได้จากการละลายด้วยสารไดเอทิลีนไตรไนตริล โลเพนตะ อะซิติกแอซิด ซึ่งสามารถละลายและสร้างสารประกอบเชิงซ้อนกับแบเรียมไอออนได้อย่างมีประสิทธิภาพ จากผลการศึกษาแสดงให้เห็นว่าตะกอนมีการเกาะติดแบบไม่สม่ำเสมอและส่วนมากเกาะอยู่ที่ผิวในช่วงหน้าของแคปิลลารี

อีกปัญหาหลักที่เกิดขึ้นระหว่างกระบวนการแมทริกซ์เอชไอเซชันคือ การตกตะกอนของซิลิกอน งานวิจัยนี้จึงได้ศึกษาเกี่ยวกับอิทธิพลของอุณหภูมิที่มีผลต่อการตกตะกอนของซิลิกอนในสภาวะกรดที่รุนแรงและที่อุณหภูมิ 50 องศาเซลเซียส จากผลการทดลองพบว่า การเติบโตของอนุภาคซิลิกอนที่อุณหภูมิสูงเกิดขึ้นเร็วกว่าที่อุณหภูมิต่ำ (5 องศาเซลเซียส) และจากการทดลองโดยใช้เครื่องยูวี-วิส พบว่ากลไกการสลายตัวของกรดโมโนซิลิซิกเป็นไปตามปฏิกิริยาอันดับสาม นอกจากนี้ยังได้ศึกษาพลังงานการกระตุ้นของปฏิกิริยานี้ และพบว่ามีความเป็น 7.2 กิโลแคลอรีต่อโมล

ABSTRACT

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In the oil industry, scale composed of barium sulfate (BaSO_4) is one of the most troublesome and expensive problems found in the oil production process due to its relative low solubility compared with other typical scale minerals. This research is focused on developing a technique for investigating barium sulfate deposition - in particular. Capillary technique has been developed as a potential technique for scale deposition experiments. Subsequently, this technique is used to investigate the deposition mechanism by the change in pressure drop. Moreover, the mass of the deposit formed was determined by dissolution with DTPA (Diethylenetrinitriolpenta acetic acid) which effectively dissolve and form complex with barium ions. The results show that the deposit is non-uniform and preferentially located near the beginning of the capillary.

Another major problem mainly found in the oil industry is silica precipitation during matrix acidization. This research has observed the influence of thermal effect on silica precipitation in acidic circumstance at 50°C . The results show that the silica particle growth at high temperature is greater than that at low temperature (5°C). From UV-Vis experiments, it was found that the monosilicic acid disappearance rate is third order with respect to the molar concentration of monosilicic acid. The activation energy of monosilicic acid disappearance was determined and found to be 7.2 kcal/mole.

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TABLE OF CONTENTS

| | PAGE |
|---|-------------|
| Title Page | i |
| Abstract (in English) | iii |
| Abstract (in Thai) | iv |
| Acknowledgements | v |
| Table of Contents | vi |
| Table of Tables | ix |
| Table of Figures | x |
| | |
| CHAPTER | |
| I INVESTIGATION OF BARIUM SULFATE DEPOSITION BY CAPILLARY FLOW | 1 |
| 1.1 Abstract | 1 |
| 1.2 Introduction | 1 |
| 1.3 Literature Review | 3 |
| 1.3.1 Scale Formation | 3 |
| 1.3.2 Barium Sulfate | 4 |
| 1.3.3 Barium Sulfate Scale Tendency | 5 |
| 1.3.4 Barium Sulfate Deposition/Precipitation | 5 |
| 1.3.5 Technique for Investigating Barium Sulfate Deposition | 6 |
| 1.3.6 Dissolution of Barium Sulfate Scale Deposit | 7 |
| 1.4 Experimental | 8 |
| 1.4.1 Materials | 8 |
| 1.4.2 Equipments | 8 |
| 1.4.3 Software | 9 |
| 1.4.4 Experimental Apparatus | 9 |
| 1.5 Results and Discussion | 11 |
| 1.5.1 Equipment Design and Testing for Scale Deposition | 11 |

| CHAPTER | PAGE |
|---|-------------|
| 1.5.2 Initial Results | 15 |
| 1.5.3 Deposition Analysis | 18 |
| 1.5.4 Different Operation time | 21 |
| 1.6 Conclusions and Recommendations | 23 |
| 1.7 References | 24 |
| | |
| II THERMAL EFFECT ON SILICA PRECIPITATION IN ACIDIC SOLUTION | 27 |
| 2.1 Abstract | 27 |
| 2.2 Introduction | 27 |
| 2.3 Literature Review | 28 |
| 2.3.1 Matrix Acidization | 28 |
| 2.3.2 Analcime Dissolution | 29 |
| 2.3.3 Silica Polymerization/Precipitation | 30 |
| 2.3.4 Aggregation Modeling | 31 |
| 2.3.5 Thermal Effect on Silica Precipitation | 34 |
| 2.4 Experimental | 36 |
| 2.4.1 Materials | 36 |
| 2.4.2 Equipments | 36 |
| 2.4.3 Software | 36 |
| 2.4.4 Experimental Apparatus | 36 |
| 2.4.5 Characterization Techniques | 37 |
| 2.5 Results and Discussion | 38 |
| 2.5.1 Silica Precipitation | 38 |
| 2.5.2 Particle Growth Predictions Using Geometric Population Balance Equations | 42 |
| 2.5.3 Thermal Effect on Monosilicic Acid Disappearance | 43 |
| 2.6 Conclusions and Recommendations | 46 |
| 2.7 References | 47 |

| CHAPTER | PAGE |
|--------------------------------|-------------|
| APPENDICES | 49 |
| A. Capillary Length Experiment | 50 |
| CURRICULUM VITAE | 52 |

LIST OF TABLES

| TABLE | | PAGE |
|--------------|---|-------------|
| 1.1 | Comparison of ΔP and radius for a section of 2 batches of capillaries | 14 |
| 1.2 | Comparison of capillary radius before deposition, after deposition, and after dissolution | 17 |
| 1.3 | The collected mass of 3 capillary sections | 21 |
| 1.4 | Comparison of the measured pressure drop of each section after deposition for different operation time | 22 |
| 1.5 | Comparison of the calculated uniform deposit mass and the collected mass of each section after deposition | 22 |
| 2.1 | Parameter values of the linear relationship | 44 |

LIST OF FIGURES

| FIGURES | PAGE |
|---|------|
| 1.1 Schematic of mixing of injected seawater and formation water in a reservoir which causes precipitation of barium sulfate. | 4 |
| 1.2 Barium sulfate scale deposited on the pipe wall and surface facilities. | 4 |
| 1.3 Schematic diagrams of the structures of EDTA and DTPA | 7 |
| 1.4 Schematic of the experimental apparatus for barium sulfate deposition studies. | 9 |
| 1.5 Theoretical and experimental values of pressure drop across the capillary for different flow rates. | 12 |
| 1.6 Error between theoretical and experimental values of pressure drop for different flow rates. | 13 |
| 1.7 Theoretical and experimental values of pressure drop across the capillary for different flow rates, using measured radius for the calculations. | 13 |
| 1.8 Error between theoretical and experimental values of pressure drop for different flow rates, using measured radius for the calculations. | 14 |
| 1.9 An increase in the pressure drop vs. time for 3 ft length capillary. | 15 |
| 1.10 Pressure drop due to deposition vs. time for 3 ft length capillary. | 16 |
| 1.11 Percentage of barium sulfate dissolution as a function of DTPA volume. | 17 |
| 1.12 Mass of removed deposit as a function of time. | 18 |
| 1.13 Schematic of uniform deposit analysis. | 18 |
| 1.14 Schematic of non-uniform deposit analysis. | 19 |
| 1.15 Schematic of capillary sections. | 20 |
| 2.1 Schematic of hydrogen ion adsorption mechanism. | 30 |
| 2.2 Schematic of surface reaction mechanism. | 30 |

| FIGURES | PAGE |
|--|-------------|
| 2.3 A schematic outline of the polymer growth from monomer to tetramer. | 31 |
| 2.4 Representative particle growth profiles in accord with (a) DLA and (b) RLA. | 33 |
| 2.5 Mean particle diameter versus time for pure monosilicic acid in 2M, 4M, and 8M HCl solution with exponential fitting curves. | 35 |
| 2.6 Experimental Setup. | 37 |
| 2.7 Concentration – time trajectory in 170mM monosilicic acid + 4M HCl solution at 50 °C measured by ICP/MS. | 39 |
| 2.8 Mean silica particle diameter versus time in 170mM monosilicic acid + 4M HCl solution at 50 °C measured using DLS. | 40 |
| 2.9 Concentration-time trajectories in 170 mM monosilicic acid + 4MHCl solution at 5 and 50 °C measured by ICP/MS. | 41 |
| 2.10 Mean silica particle diameter versus time in 170 mM monosilicic acid + 4MHCl solution at 5 and 50 °C measured using DLS. | 41 |
| 2.11 Comparison of the silica particle growth between experimental data at 50 °C and simulation using RLA model. | 43 |
| 2.12 The molybdate-reactive silica data: initial Si(OH) ₄ concentration of 170 mM with 4MHCl at different temperature. | 44 |
| 2.13 The Arrhenius plot, $-\ln k_D$ versus $1/T$. | 45 |
| A.1 The pressure drop vs. time plot comparing an experiment conducted with the long capillary to the one conducted with the short capillary. | 50 |
| A.2 Proposed deposition mechanism only at first 3 ft section. | 51 |