

**INVESTIGATING TIME DEPENDENT ASPHALTENE PRECIPITATION
BEHAVIOR**

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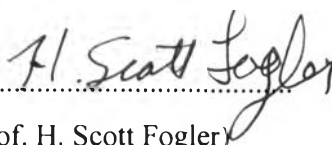
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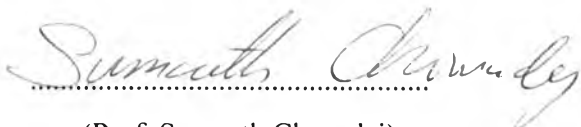
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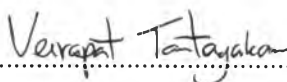
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ABSTRACT

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Asphaltenes precipitation is strongly a time-dependent phenomena and it can take up to several months for destabilized asphaltenes to grow to their final state after precipitant addition. The main focus of this work is to investigate differences in properties and aggregation behavior of asphaltenes precipitated at different times. Asphaltenes are fractionated from crude oil by adding a precipitant (e.g. heptane) at a fixed concentration, and destabilized asphaltenes are collected at different times until equilibrium is reached. Small-Angle X-ray Scattering (SAXS), Nuclear Magnetic Resonance (NMR), Inductively Coupled Plasma Mass Spectrometry (ICP-MS) and Elemental Analysis (EA) were used to characterize fractionated asphaltenes samples. Preliminary results showed that the differences in the properties of asphaltenes fractionated at different precipitant concentrations and times are slightly different for SAXS, ICP-MS and EA techniques. However, there was no significant trend observed from NMR results. We also investigated the aggregation behavior of time-based fractionated asphaltenes by dissolving them in a solvent and monitoring their aggregation behavior after precipitant addition by microscopy experiments. The microscopy results showed that the aggregation behaviour of the time based fractions are different. The fraction that precipitate earlier has significantly higher aggregation rate than the fraction that precipitate later. This indicated that the first fraction to precipitate is the more unstable fraction and has higher aggregation tendency.

บทคัดย่อ

ธรรมชาติ สมพันธ์: การศึกษาการตกตะกอนของแอสฟัลทีนที่ขึ้นกับเวลา
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 หน้า

การตกตะกอนของแอสฟัลทีนเป็นกระบวนการที่ขึ้นกับเวลาและอาจใช้เวลาหลายเดือน
 สำหรับแอสฟัลทีนที่ไม่เสถียรให้เติบโตจนถึงขั้นสุดท้ายหลังจากการใส่สารตกตะกอน
 วัตถุประสงค์ของงานวิจัยนี้คือเพื่อศึกษาความแตกต่างของคุณสมบัติและพฤติกรรมรวมตัว
 ของแอสฟัลทีนที่ตกตะกอนที่เวลาต่างๆ โดยแอสฟัลทีนถูกแยกจากน้ำมันดิบด้วยการเติมสาร
 ตกตะกอน (เช่น เฮปแทน) ที่ความเข้มข้นคงที่และแอสฟัลทีนที่ไม่เสถียรจะถูกเก็บที่เวลาต่างๆ
 จนถึงจุดสมดุล จากนั้น จึงใช้เทคนิค Small-Angle X-ray Scattering (SAXS), Nuclear Magnetic
 Resonance (NMR), Inductively Coupled Plasma Mass Spectrometry (ICP-MS) และ Elemental
 Analysis (EA) เพื่อศึกษาตัวอย่างของแอสฟัลทีนที่ถูกแยกออกมา ผลการศึกษาแสดงให้เห็นว่า
 ความแตกต่างของคุณสมบัติของแอสฟัลทีนที่ถูกแยกออกมาที่เวลาและความเข้มข้นต่างๆของสาร
 ตกตะกอนมีความแตกต่างกันเล็กน้อยสำหรับการใช้เทคนิค SAXS, ICP-MS และ EA อย่างไรก็
 ตามไม่พบแนวโน้มที่มีความสำคัญจากผลของ NMR นอกจากนี้ ยังได้ศึกษาพฤติกรรมรวมตัว
 ของแอสฟัลทีนซึ่งถูกแยกที่เวลาต่างๆกัน โดยละลายแอสฟัลทีนในตัวทำละลายและสังเกต
 พฤติกรรมรวมตัวของแอสฟัลทีนหลังจากเติมสารตกตะกอนโดยใช้กล้องจุลทรรศน์ ซึ่งพบว่า
 พฤติกรรมรวมตัวของแอสฟัลทีนซึ่งถูกแยกที่เวลาต่างๆกันมีความแตกต่างกัน โดยส่วนที่
 ตกตะกอนก่อนมีอัตราการรวมตัวกันที่เร็วกว่าอย่างมีนัยสำคัญกว่าส่วนที่ตกทีหลังซึ่งบ่งชี้ว่า ส่วน
 ที่ตกตะกอนก่อนมีความไม่เสถียรมากกว่าและมีแนวโน้มที่จะรวมตัวกันสูงกว่า

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