

STUDYING ASPHALTENE INSTABILITY BY CAPILLARY DEPOSITION




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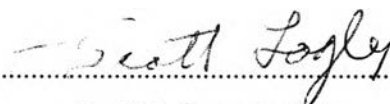
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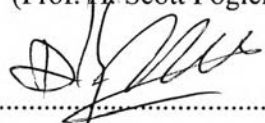
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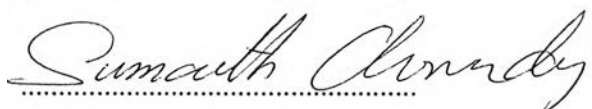
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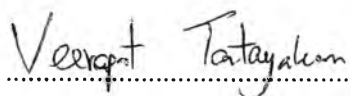

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ABSTRACT

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Asphaltene deposition can occur during oil production and processing. It is necessary to understand the mechanism of asphaltene deposition in order to improve prediction and prevention of deposits. The capillary deposition technique was employed to study the asphaltene deposition process. The deposition apparatus has been developed to preserve the deposit. Scanning electron microscope (SEM) images of the asphaltene deposit generated confirm that proper mixing has been obtained in the deposition apparatus. To check for wide applicability of the results for Oil A, experiments were performed with an additional crude oil. Similar results were observed for both crude oils, showing that the deposit is roughly uniform and thinner at the outlet, suggesting proper mixing is obtained in the deposition system. In a parallel study, experiments were performed by flowing a previously precipitated asphaltene solution through a capillary. The results show that asphaltenes do not deposit in the capillary after they complete their growth (95 hr aging time) indicating that deposition occurs when the asphaltene nanoaggregates are in the process of aggregating.

บทคัดย่อ

วิทยานิพนธ์ : การศึกษาความไม่เสถียรตัวของแอสฟัลทีนโดยการทดลองด้วยท่อแคปิลลารี (Studying Asphaltene Instability by Capillary Deposition) อ. ที่ปรึกษา : ศ. ดร. เอกสิทธิ์ ฟูกลอร์ และ ศศ. ดร. ปมทอง มาลากุล ณ อยุธยา 39 หน้า

การเกาะตัวของแอสฟัลทีนสามารถเกิดขึ้นในกระบวนการผลิตและแปรรูปน้ำมันดิบ จึงมีความจำเป็นที่จะต้องศึกษากลไกการเกาะตัวของแอสฟัลทีนเพื่อปรับปรุงการคาดการณ์และการป้องกันการเกาะตัวของแอสฟัลทีน โดยศึกษานี้ใช้การทดลองด้วยท่อแคปิลลารีเพื่อศึกษา กลไกการเกาะตัวและความไม่เสถียรของแอสฟัลทีน และพัฒนาเครื่องมือที่ใช้ศึกษาการเกาะตัวขึ้น เพื่อตรวจสอบรักษาตะกอนของแอสฟัลทีน กล้องจุลทรรศน์แบบ Scanning electron microscope (SEM) ได้ถูกนำมาใช้ศึกษาการเกาะตัวของแอสฟัลทีนเพื่อยืนยันการเกิดการผสมของสารที่เหมาะสมภายในเครื่องมือ การศึกษานี้ได้ขยายขอบเขตการศึกษาไปถึงน้ำมันดิบชนิดอื่นเพื่อเปรียบเทียบผลการทดลอง จากผลการทดลองแสดงให้เห็นว่า น้ำมันดิบทั้งสองชนิดเกิดการเกาะตัวในลักษณะเดียวกัน กล่าวคือ แอสฟัลทีนเกาะตัวโดยรอบที่ทางเข้าของท่อแคปิลลารีและความหนาจะลดลงที่ทางออกของท่อแคปิลลารี การเกาะตัวโดยรอบของแอสฟัลทีนนี้แสดงถึงการผสมกันของสารที่เกิดขึ้นอย่างสมบูรณ์ นอกจากนี้ยังได้ศึกษาถึงกลไกการเกาะตัวของแอสฟัลทีนโดยนำสารละลายแอสฟัลทีนที่มีตะกอนแอสฟัลทีนมาไหลผ่านท่อแคปิลลารี จากผลการศึกษาพบว่า แอสฟัลทีนไม่เกาะตัวบนผิวของแคปิลลารีเมื่อการรวมตัวของแอสฟัลทีนนั้นเกิดขึ้นอย่างสมบูรณ์แล้ว (เวลาในการบ่ม 95 ชั่วโมง) แสดงให้เห็นว่า การเกาะตัวนั้นเกิดขึ้นระหว่างการรวมตัวของอนุภาคนาโนของแอสฟัลทีน

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