# Asphaltene Deposition from Destabilized Oils with Water Emulsions Using Porous Microfluidics Chip

Hunter Ducharme[1], Peng He[2], Yu-Jiun "Nate" Lin[2], Sibani Lisa Biswal[2]

[1] Rice Office of STEM Engagement, Rice University
[2] Chemical and Bimolecular Engineering, Rice University

## Introduction

- **Asphaltenes** are naturally found inside of crude oil that precipitate in the presence of a solvent, a change in pressure, and/or a change in temperature.
- **The problem is** water emulsions increase the deposition of asphaltenes inside of flow lines and reservoir rocks.
- **The objective is** to understand the effects of various salts on ashplatene deposition relating to water-in-oil emulsions.

Figure 1: Deposition of asphaltenes inside of a pipe [1].

## Materials and Methods

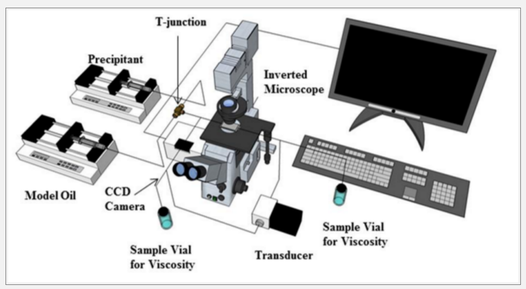


Figure 2: Experimental setup [2].

1. Heptane and crude oil are pumped into the microfluidic device.
2. The pressure is recorded using a transducer.
3. Asphaltene deposition is recorded and measured using high speed optical microscopy.

## Water's Impact on Deposition

The presence of water in crude oil positively correlates with the deposition of asphaltenes and emulsions.

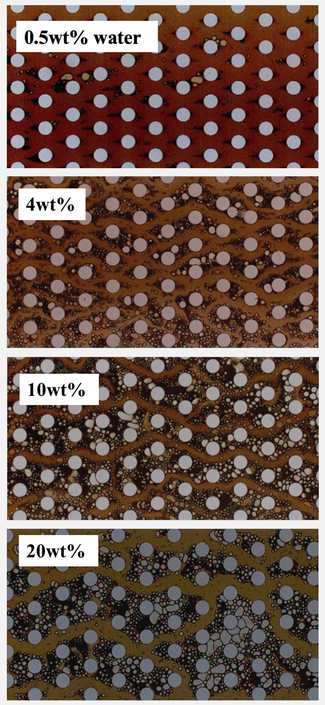


Figure 3: Asphaltene deposition inside the porous media with varying water concentrations. Courtesy of Yu-Jiun "Nate" Lin.

### Water-in-Oil Emulsion Interface

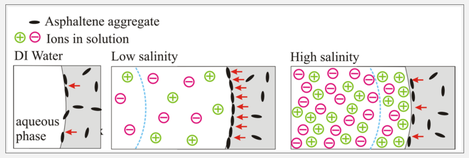


Figure 4: The water-in-oil emulsion interface. T. Chávez-Miyauchi, et al. (2016).

The presence of salts disrupts the emulsion interface by introducing positive and negative ions that repel the asphaltenes from aggregating on the emulsion interface.

## Salt's Impact on Deposition

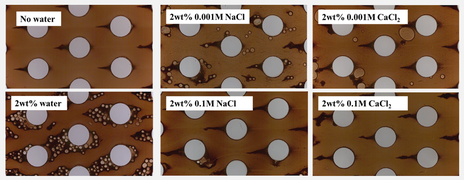


Figure 5: Asphaltene deposition inside the porous media. These figures used a solution with 2 wt% water. Each data set represents a specific concentration of sodium. Courtesy of Yu-Jiun "Nate" Lin.

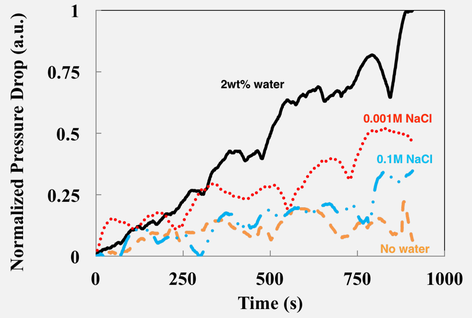


Figure 6: The difference in pressure between the inlet and outlet of the microfluidics device. This figure used a solution with 2 wt% water. Each data set represents a specific concentration of sodium. Courtesy of Yu-Jiun "Nate" Lin.

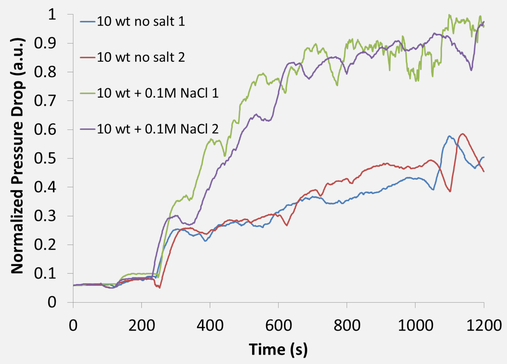


Figure 7: The difference in pressure between the inlet and outlet of the microfluidics device. This figure used a solution with 10 wt% water. Each data set represents a specific concentration of sodium.

## Conclusion

**The presence of water** increases deposition by

- Aggregating with existing asphaltene depositions.
- Clogging the flow streams and creating blockage.

**The presence of salts**

- Reduces the asphaltenes on the emulsion interface, but this effect is not linear.
- Adding more salt causes smaller emulsions to come together and coalesce into bigger emulsions.
- This increases blockage in the porous media.

## Acknowledgements

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## References

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Examining asphaltene solubility on deposition in model porous media.
*Langmuir*, 2016.