Contribution ID: **43**

Type: **Poster Presentation**

Nanomechanical properties of Janus nanoparticle-stabilized Pickering emulsion in confined nanochannels

Monday, 13 May 2024 14:55 (1h 30m)

The crucial role of the interaction between Pickering emulsions and confined nanochannels in their industrial applications is well acknowledged. However, there is a limited understanding of how the modulation of deformation stability and rupture limits of Pickering emulsions occurs when they come into contact with solid walls, particularly in relation to the influence of solid particle shells. This study employs molecular dynamics (MD) simulations to elucidate the nanomechanical properties of Pickering emulsions stabilized by Janus nanoparticles (JNP) in confined channels. For the first time, a comprehensive predictive model is developed to characterize the contact behavior of Pickering emulsions with surfaces exhibiting distinct wettability. The contact stress experienced by an emulsion is found to be dependent on factors such as the equivalent elastic modulus of the emulsion, geometric deformation function, and the influence of the JNP shell along with its interactions. Additionally, it is observed that hydrophobic surfaces induce the rupture of Pickering emulsions under compression. The delay in rupture is achieved by increasing the surface coverage (ϕ) of JNP. Notably, when ϕ reaches a critical value, the JNP shell can assume an ordered quasi-solid structure, leading to a significant enhancement in emulsion stability. These findings have practical implications for the design and screening of specific Pickering emulsions, especially in applications such as enhanced oil recovery, drug or food delivery, and cosmetic ingredient absorption, where the management of deformation and rupture on solid surfaces is crucial.

Acceptance of the Terms & Conditions

Click here to agree

Student Awards

Country

CANADA

Porous Media & Biology Focused Abstracts

References

Primary author: Dr CHANG, yuanhao (university of regina)

Co-authors: Mr WANG, bo (u); Dr ZENG, fanhua (university of regina)

Presenter: Dr CHANG, yuanhao (university of regina)

Session Classification: Poster

Track Classification: (MS13) Fluids in Nanoporous Media