Contribution ID: **548** Type: **Poster (+) Presentation**

Film entrainment and particle transport during gas invasion in suspension-filled microchannels

Wednesday, 2 June 2021 16:00 (1 hour)

Displacement of particle suspension by air is ubiquitous in nature where the particle transport plays an important role in the displacement process. Here we experimentally study the film entrainment and particle transport during gas–suspension displacement in microchannels. We characterize three flow regimes, ranging from no deposition to particle entrapment and to particle layering within liquid films, depending on the withdrawal rates and the particle volume fraction in the suspension. The film thickness is shown to be dependent on a modified capillary number Ca0 which takes into account the effects of flow velocity, particle volume fraction, and channel shape and effectively captures the general behavior of microplastics entrainment for particle volume fraction in the range of 0~20%. A theoretical prediction of the critical capillary number Ca0* for particle entrainment is found to be consistent with the experimental results. The probability of entrainment for particles near the gas invading front is found to be proportional to both particle volume fraction and the capillary number. This work elucidates the mechanism responsible for the effect of suspended microplastics on immiscible displacement in confined geometries and is of practical importance in many natural and engineered applications spanning from environmental systems to microfluidics and geophysical flows.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

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Student Poster Award

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