**Introduction**

**Diffusiophoresis** is the controlled migration of colloidal particles (P) due to concentration gradients of other solutes such as salts (S).

\[
\nu_p = -D_p \left( \frac{\nabla \ln C_p + \hat{D}_{ps} \nabla \mu}{RT} \right)
\]

Brownian Diffusion  
Diffusiophoresis Coefficient

\[
\nu_S = -\frac{D_S}{C_S} \left( \nabla \ln C_S + D_{sp} \nabla \ln C_p \right)
\]

Salt Migration Rate  
Osmotic Diffusion

**Migration Direction**

Interfacial Interactions  
Particle-Water-Salt.

**Our Focus:** study diffusiophoresis of non-charge colloidal particles.

**Preferential Hydration Mechanism**

Vicinity of particle surface is depleted of salt.

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**Methodology**

**TCU Green Monster**

Rayleigh Interferometry Patterns

A cell with two compartments has a top solution with salt (micelles) and a bottom solution with salt and micelles. Top and bottom salt (micelles) concentrations are equal.

Initially the concentration profile looks like a step. After diffusion starts our concentration profile curves start to change. A green laser that goes through the sample generates an interferometry pattern.

**Multicomponent Diffusion Coefficients**

\[ \hat{D}_{ps} \quad \hat{D}_{sp} \]

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**Results and Conclusions**

**Diffusiophoresis Coefficient**

**Salt Osmotic Diffusion**

- At low Cs (< 0.3M), \( \hat{D}_{ps} \) linearly increases with \( C_S \). As \( C_S \) → Cloud point , \( \hat{D}_{ps}(C_S) \) sharply increases making diffusiophoresis the dominant term for micelle transport in salting-out conditions.
- \( \hat{D}_{sp}(C_S) \), allow us to quantify the micelle preferential hydration or hydrodynamic excess of water which is 6.6 \( \text{H}_2\text{O} / \text{ethoxy} \) group.
- Positive values of \( \hat{D}_{ps}(C_S) \) and \( \hat{D}_{ps}(C_S) \) means micelle migrates from high to low salt concentrations.
- Concentration gradients of \( \text{Na}_2\text{SO}_4 \) can be applied to induce migration of all PEG-based colloidal particles.

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**References**


S. Shim., Diffusiophoresis, Diffusiosmosis, and Microfluidics. Chem. Rev. DOI: 10.1021/acs.chemrev.1c00571.