ECSOC-29
2025
Conference

The 29th Intl Electronic Conference on Synthetic Organic Chemistry

14–28 November 2025 | Online

MDPI

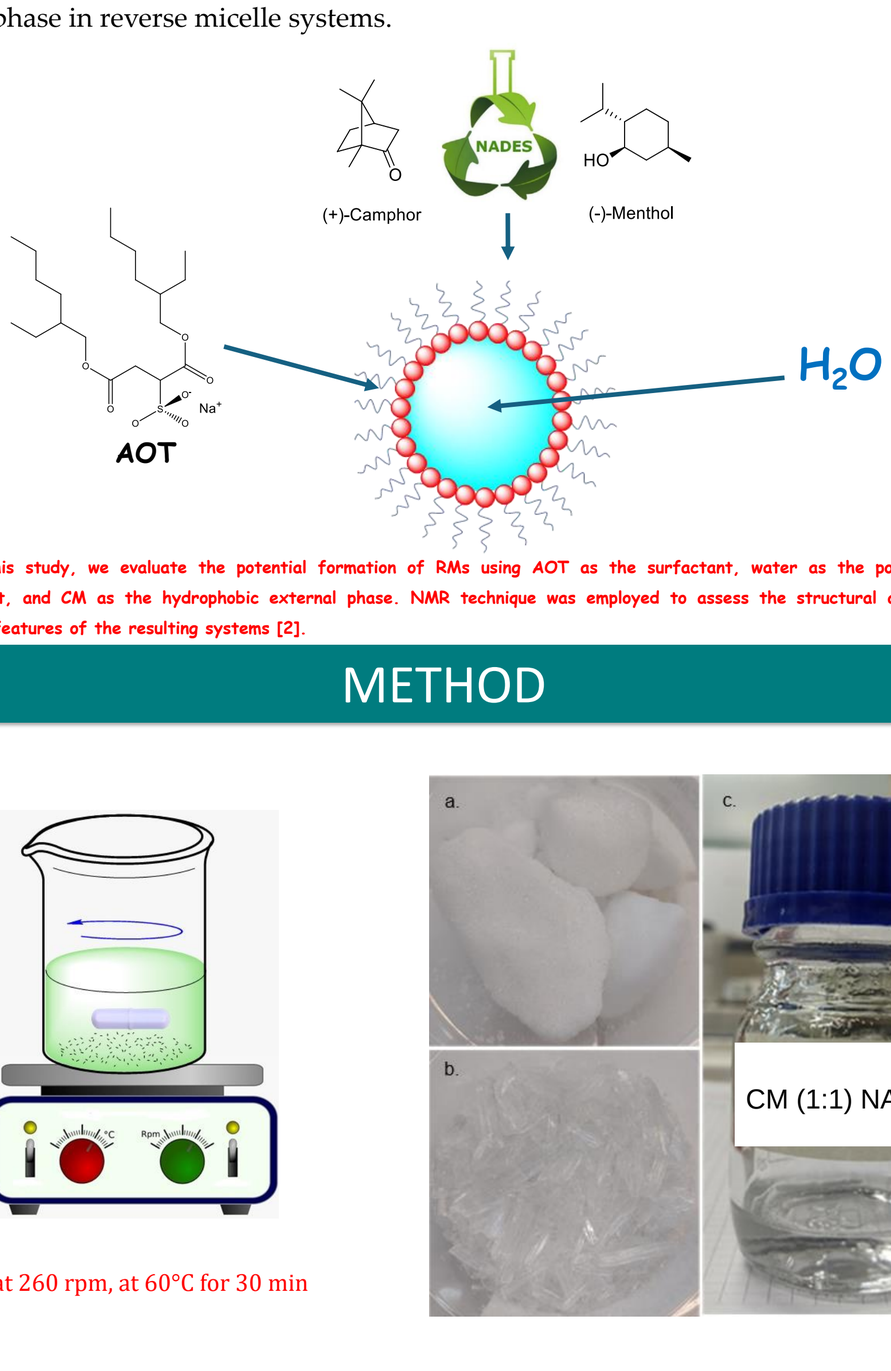
Transforming Anionic Reverse Micelles: The Potential of Hydrophobic Natural Deep Eutectic Solvents. How the mixture between camphor and menthol can be an excellent choice for reverse micelle preparation

Alejandra González, Nestor Mariano Correa, Fernando Moyano, Ruben Dario Falcone*

Departamento de Química, Instituto para el Desarrollo Agroindustrial y de la Salud (IDAS). CONICET – UNRC, Río Cuarto, Argentina.

INTRODUCTION & AIM

Reverse micelles (RMs) are nanostructures formed by dissolving surfactants in low-polarity organic solvents. A widely used anionic surfactant is AOT (sodium dioctyl sulfosuccinate), which forms aggregates capable of encapsulating water in their core [1]. The amount of solubilized water is expressed as W_0 = [H_2O]/[Surfactant]. In the context of green chemistry, Natural Deep Eutectic Solvents (NADES), such as the 1:1 mixture of camphor and menthol (CM), represent a sustainable alternative to conventional nonpolar solvents. Notably, CM exhibits a hydrophobic character, making it a promising candidate to serve as the continuous organic phase in reverse micelle systems.



In this study, we evaluate the potential formation of RMs using AOT as the surfactant, water as the polar component, and CM as the hydrophobic external phase. NMR technique was employed to assess the structural and dynamic features of the resulting systems [2].

METHOD

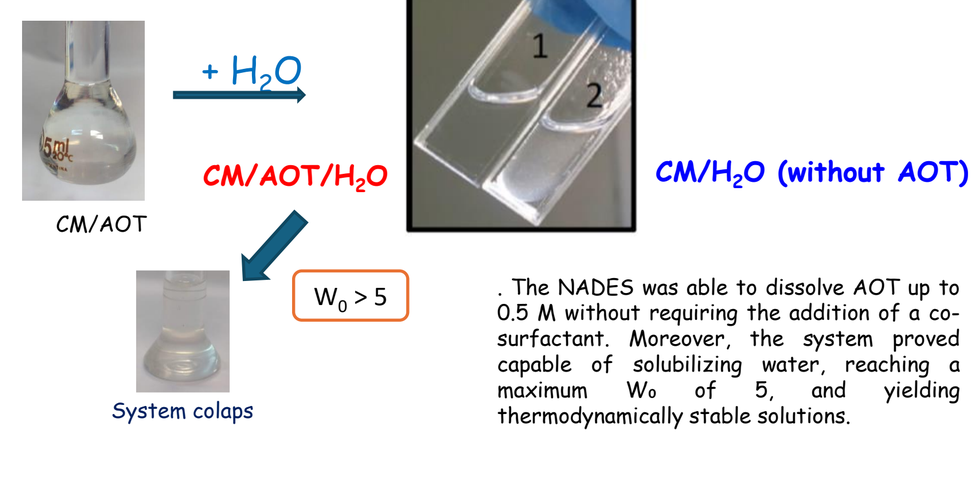
Stirring at 260 rpm, at 60°C for 30 min

CONCLUSION

This study demonstrates the formation of RMs and provides insights into the interface formed by CM/AOT at varying water contents. We show that RMs can be generated using a hydrophobic NADES, readily prepared, as the nonpolar continuous phase. This finding opens new avenues for the design of biocompatible organized systems, with promising perspectives for future applications in the food industry and medicine.

RESULTS & DISCUSSION

AOT solubilization and water addition



. The NADES was able to dissolve AOT up to 0.5 M without requiring the addition of a co-surfactant. Moreover, the system proved capable of solubilizing water, reaching a maximum W_0 of 5, and yielding thermodynamically stable solutions.

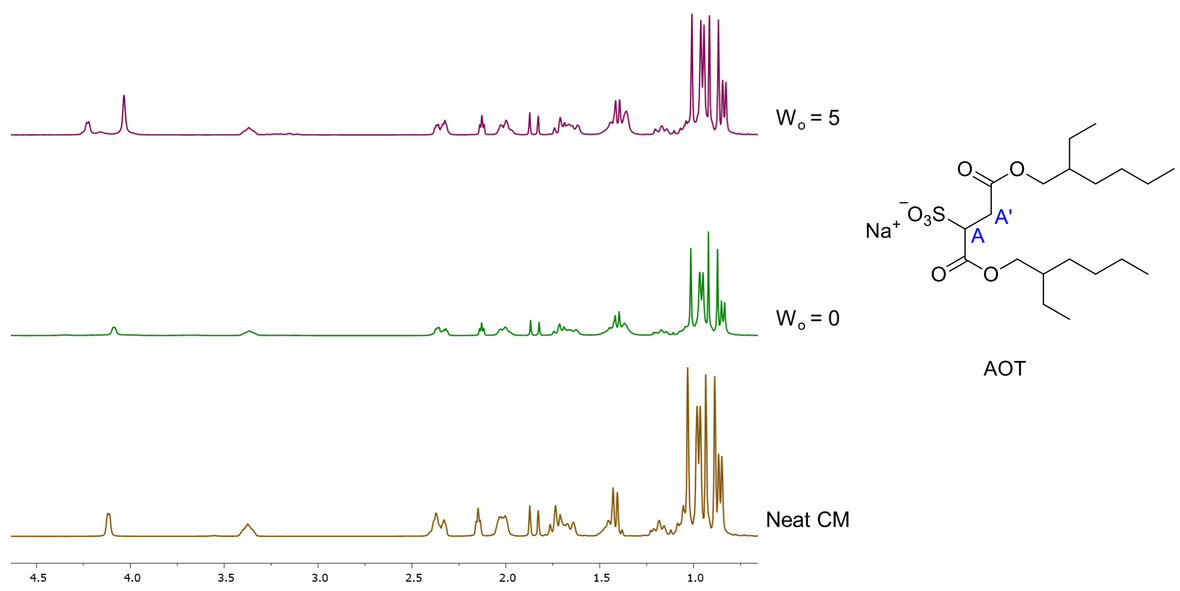


Figure 1. ^{1}H NMR spectra for neat CM and CM/AOT solutions at different W0. [AOT] = 0.5 M. T = 25°C.

Table 1. Diffusion coefficients (D) and micellar diameters (dapp) calculated by DOSY for the CM/AOT/water system.

W_o	D (m^2/s)	dapp (nm)
0	1.80x10-11	1.17
1	1.02x10-11	2.06
2	7.41x10-12	2.84
3	7.01x10-12	3.00
4	6.77x10-12	3.11
5	6.17x10-12	3.41

$$dapp = kT / 3\pi\eta D \quad (1)$$

where k is the Boltzmann constant, T is the absolute temperature, and η is the solvent viscosity.

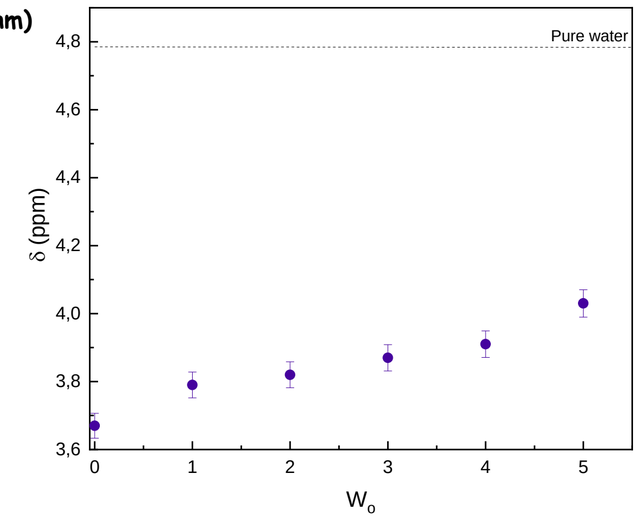


Figure 2. ^{1}H chemical shift values of entrapped water in CM/AOT RMs as a function of water content. [AOT] = 0.5 M. For comparison, the value of neat water (- - -) is also plotted.

REFERENCES

1. N. M. Correa, J. J. Silber, R. E. Riter, N. E. Levinger, *Chem. Rev.* **2012**, *112*, 4569.
2. R. D. Falcone, B. Baruah, E. Gaidamauskas, C. D. Rithner, N. M. Correa, J. J. Silber, D. C. Crans, N. E. Levinger, *Chem. – A Eur. J.* **2011**, *17*, 6837.