

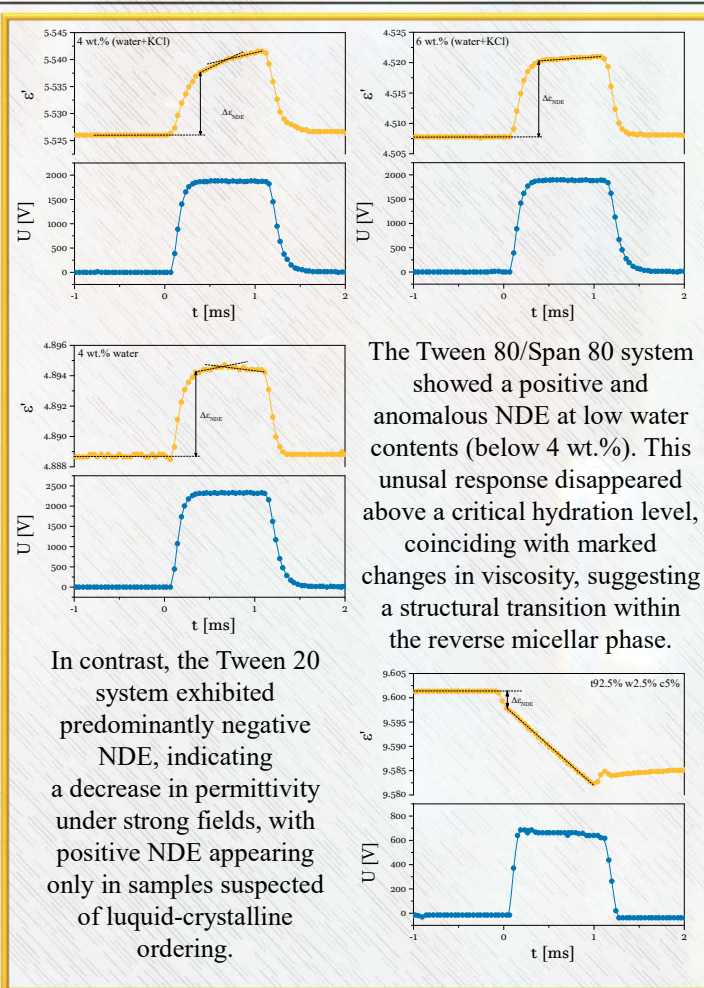
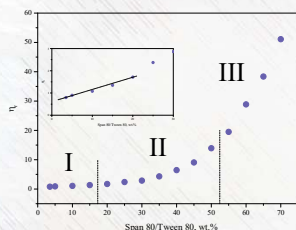
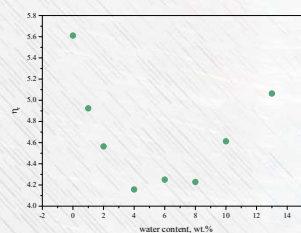
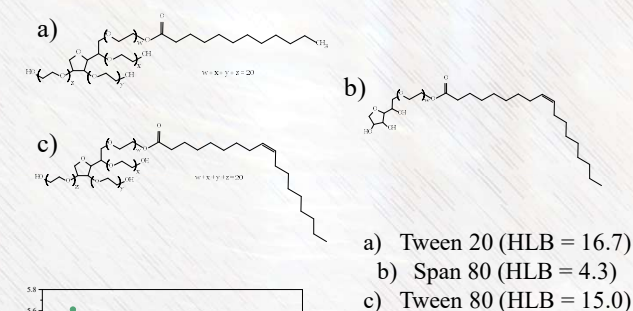
# DIELECTRIC PROPERTIES OF REVERSE MICELLES FORMED BY NONIONIC SURFACTANTS

Sara Helscher, Kazimierz Orzechowski

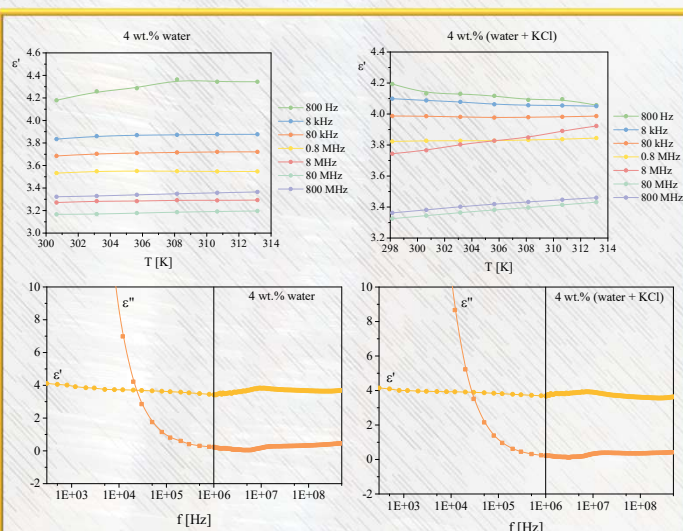
Faculty of Chemistry, University of Wrocław, Fryderyka Joliot-Curie 14,  
50-383 Wrocław, Poland  
333205@uwr.edu.pl

## ABSTRACT

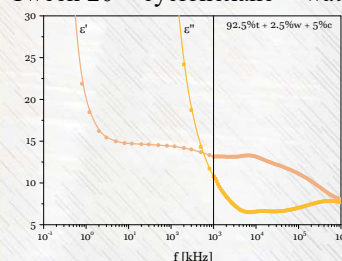
Reverse micellar systems formed by nonionic surfactants provide an effective model for studying confined water and nanoscale aggregation in nonpolar media. We investigated reverse micelles of Tween 20 in cyclohexane<sup>[1]</sup> and mixed Tween 80/Span 80 in decane<sup>[2]</sup> at selected water contents, focusing on their dielectric and aggregation behavior. The nonlinear dielectric effect (NDE)<sup>[3]</sup>, defined as the difference between permittivity measured under strong and weak electric fields, was used as a sensitive probe of microstructural changes.



In contrast, the Tween 20 system exhibited predominantly negative NDE, indicating a decrease in permittivity under strong fields, with positive NDE appearing only in samples suspected of liquid-crystalline ordering.



Tween 20 + cyclohexane + water



No electrode polarization is observed for Tween 80/Span 80 + decane, confirming that its dielectric response arises from structured reverse micelles and confined water.

## CONCLUSIONS

The Tween 80/Span80 system forms reverse micelles in decane and exhibits a positive, anomalous NDE at water content below 4 wt.%. This response disappears above a critical hydration level, where abrupt changes in viscosity indicate a structural transition of the micellar phase. In comparison, ionic reverse micelles exhibit a much stronger NDE due to charge transport.<sup>[4]</sup>

## REFERENCES

- [1] Amran, A., et al. *IOP Conference Series: Materials Science and Engineering*. Vol. 107. No. 1. IOP Publishing, 2016.
- [2] Koneva, A. S., et al. *Colloids and Surfaces A: Physicochemical and Engineering Aspects* 518 (2017): 273-282.
- [3] Orzechowski, K., & Burakowski, A. *Measurement* 131 (2019): 219-222.
- [4] Małycha K., Orzechowski K. and Burakowski A. *Journal of Molecular Structure* 1318 (2024): 139370.