# Structural analysis of PEGylated nanoemulsions using EPR spectroscopy – the impact of an active incorporated in stabilizing layer-


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## CONCLUSION

This study demonstrates that the localization of the active is one of the key elements impacting the PEGylation of the nanoemulsion (NE) system. To pick the concentration of the PEGylated phospholipid that will offer the best surface coverage without compromising the integrity of the interface, additional considerations must be addressed in the event of an active situated in the stabilizing layer.

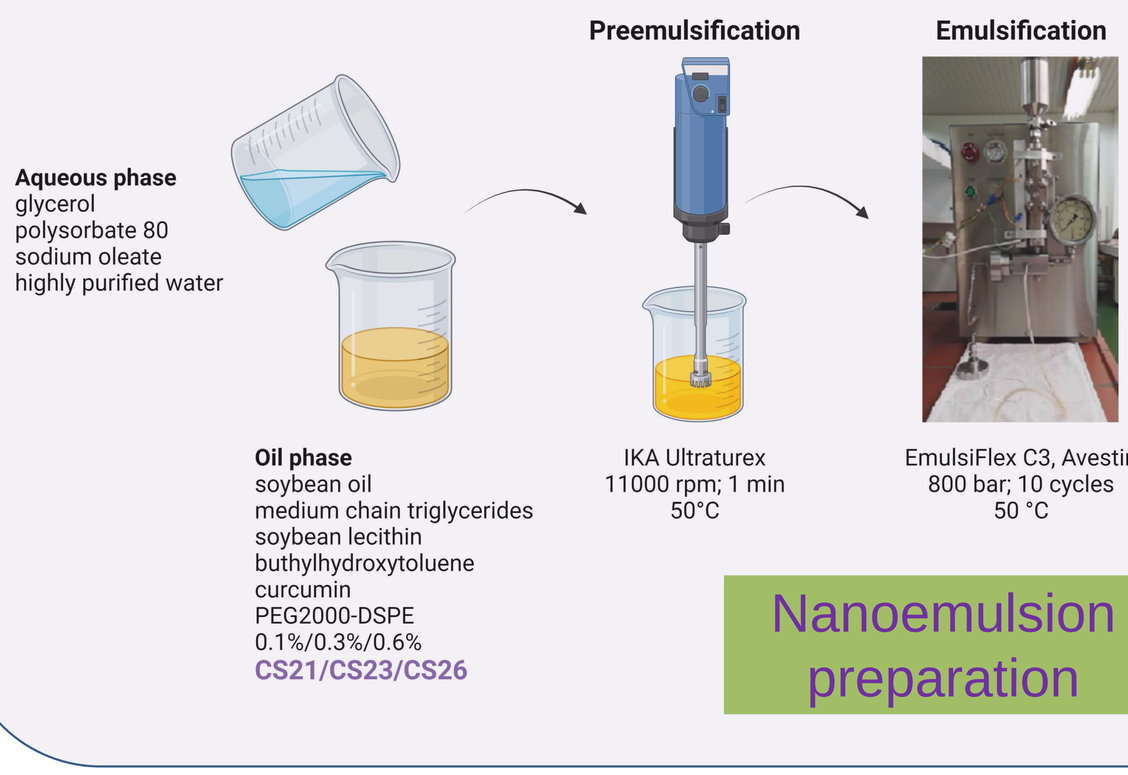
## INTRODUCTION

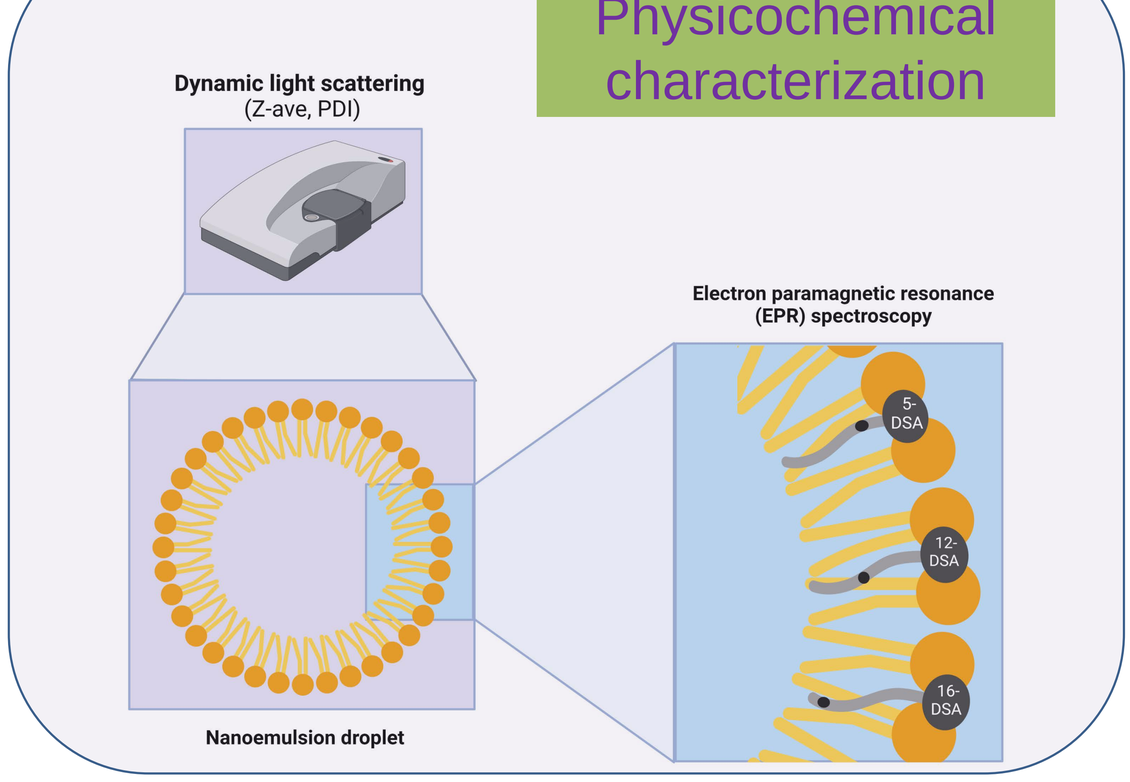
NEs offer a flexible platform for drug delivery via several administration routes. Rapid plasma clearance brought on by interactions with plasma proteins and the activation of the mononuclear phagocytic system is the greatest challenge NEs face upon parenteral administration. PEGylation is a method used to ensure longer droplet circulation. The selection of optimal PEGylated phospholipid concentration is necessary to achieve desired physicochemical properties of NEs, while providing appropriate surface coverage.

## AIM

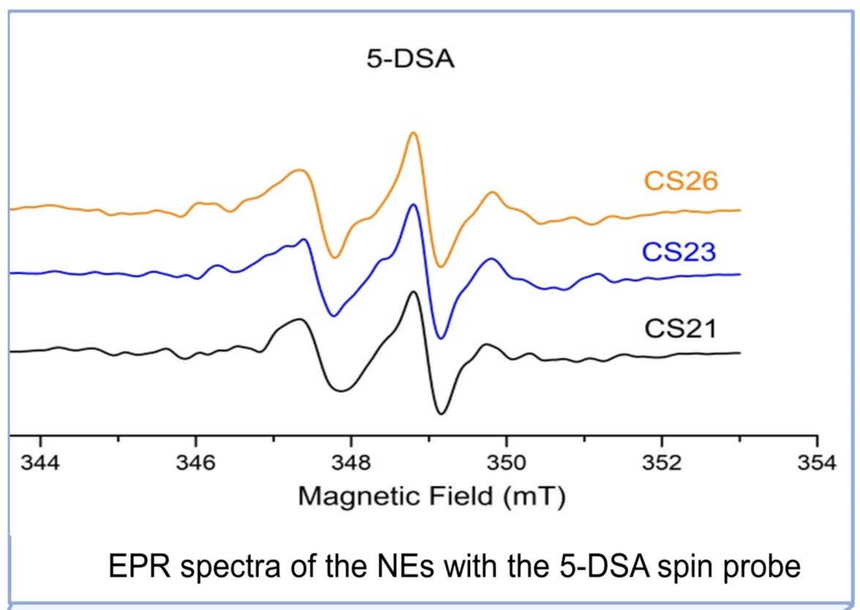
Investigating the effect of various PEG2000-DSPE concentrations on the structural properties of NEs with curcumin, an active placed in the stabilizing layer, of NEs (1-3), using the electronparamagnetic resonance (EPR) spectroscopy.

## MATERIALS AND METHODS

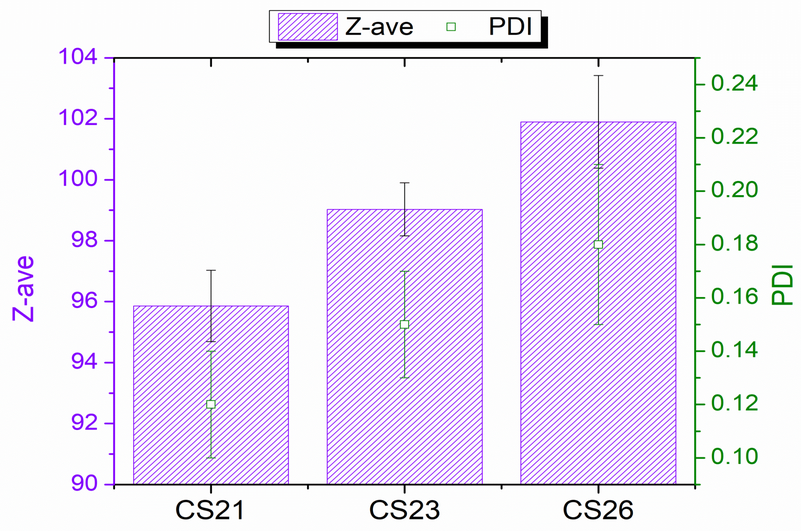



## RESULTS AND DISCUSSION




EPR spectra of the NEs with the 5-DSA spin probe




Dropet size (Z-ave) and polydispersity index (PDI)

Z-ave values between 95 and 103 nm, along with PDI values under 0.25, indicated suitability for parenteral administration.

| NEs 0 | 5-DSA | | | 12-DSA | | | 16-DSA | | |
|---|---|---|---|---|---|---|---|---|---|
| | τR (ns) | S | αN (x10$^{-4}$T) | τR (ns) | S | αN (x10$^{-4}$T) | τR (ns) | S | αN (x10$^{-4}$T) |
| CS21 | 3.71 ± 1.00 | 0.13 ± 0.04 | 11.7 ± 0.3 | 1.79 ± 0.04 | 0.10 ± 0.01 | 14.2 ± 0.0 | 0.63 ± 0.02 | 0.05 ± 0.00 | 14.7 ± 0.0 |
| CS23 | 0.63 ± 0.03 | 0.19 ± 0.05 | 12.8 ± 0.4 | 1.77 ± 0.04 | 0.10 ± 0.00 | 14.2 ± 0.2 | 0.78 ± 0.15 | 0.05 ± 0.01 | 14.7 ± 0.0 |
| CS26 | 2.12 ± 0.74 | 0.14 ± 0.07 | 12.3 ± 0.5 | 1.75 ± 0.01 | 0.11 ± 0.00 | 14.1 ± 0.1 | 0.59 ± 0.04 | 0.05 ± 0.00 | 14.7 ± 0.1 |

The stabilizing layer dynamics changed as result of the increased PEGylated phospholipid concentration, indicating PEGylation threshold has not yet been reached. The 5-DSA spin probe's spectra showed the portion of the stabilizing layer nearest to the aqueous phase was the one most affected by the increase in the PEGylated phospholipid concentration. Interestingly, further PEGylation did not strengthen the stabilizing layer, probably due to the presence of curcumin.

## REFERENCES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- Demisli, S. Et al., Nanomaterials, 2020. 10(12), 2464.


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