

# Characterization of ethylene-propylene-diene terpolymers using high-temperature size exclusion chromatography coupled with an ultraviolet detector

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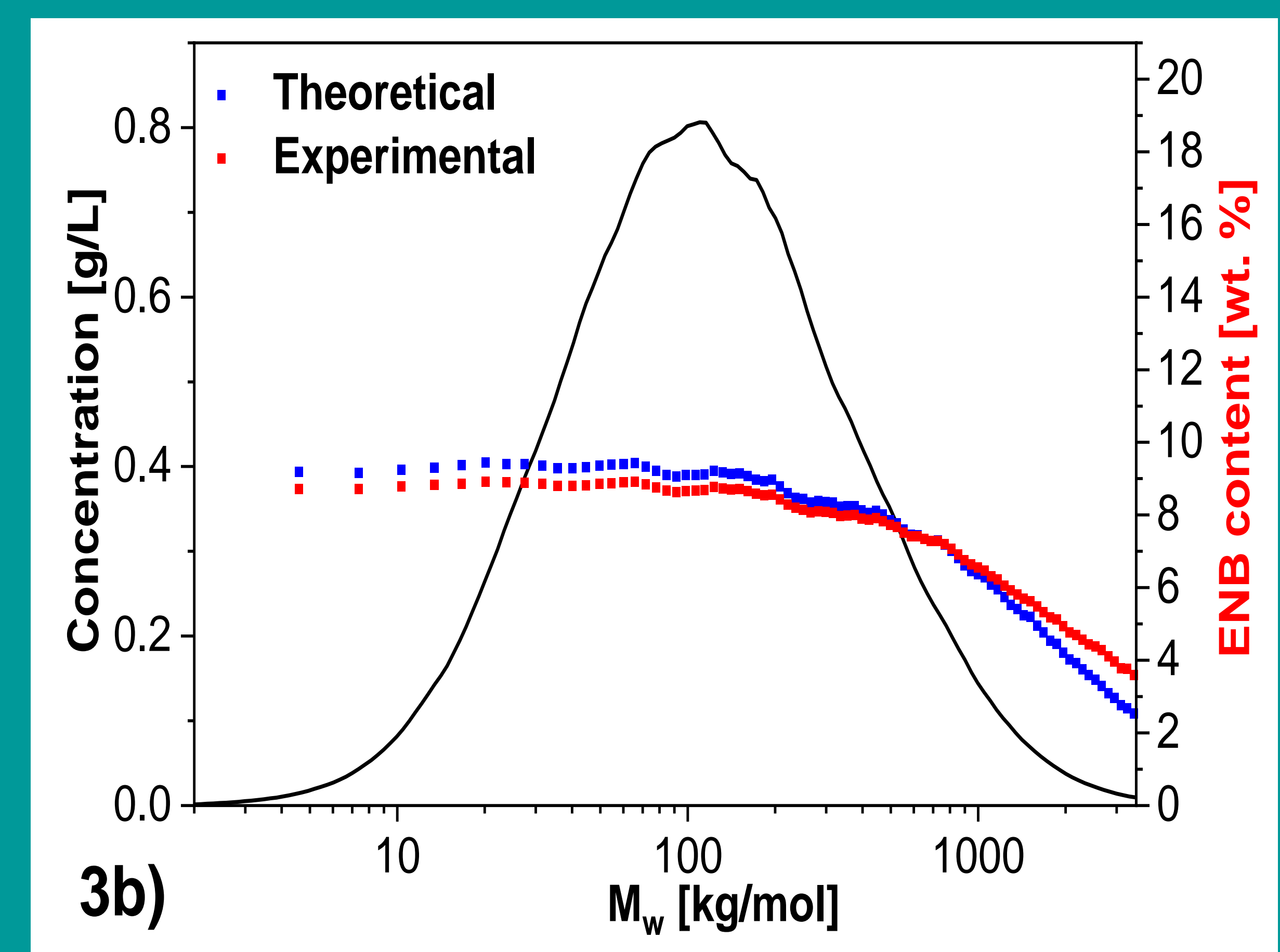
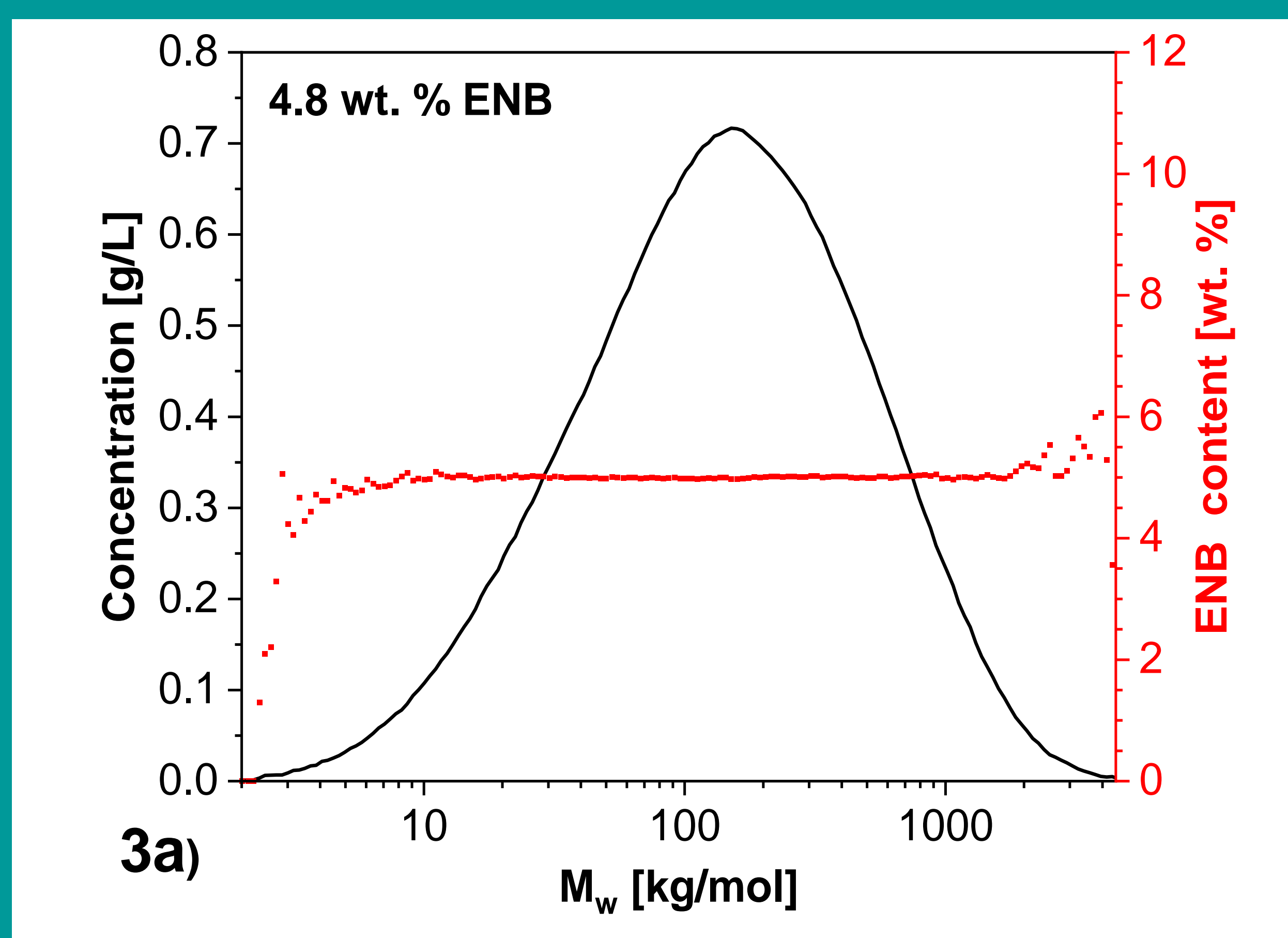
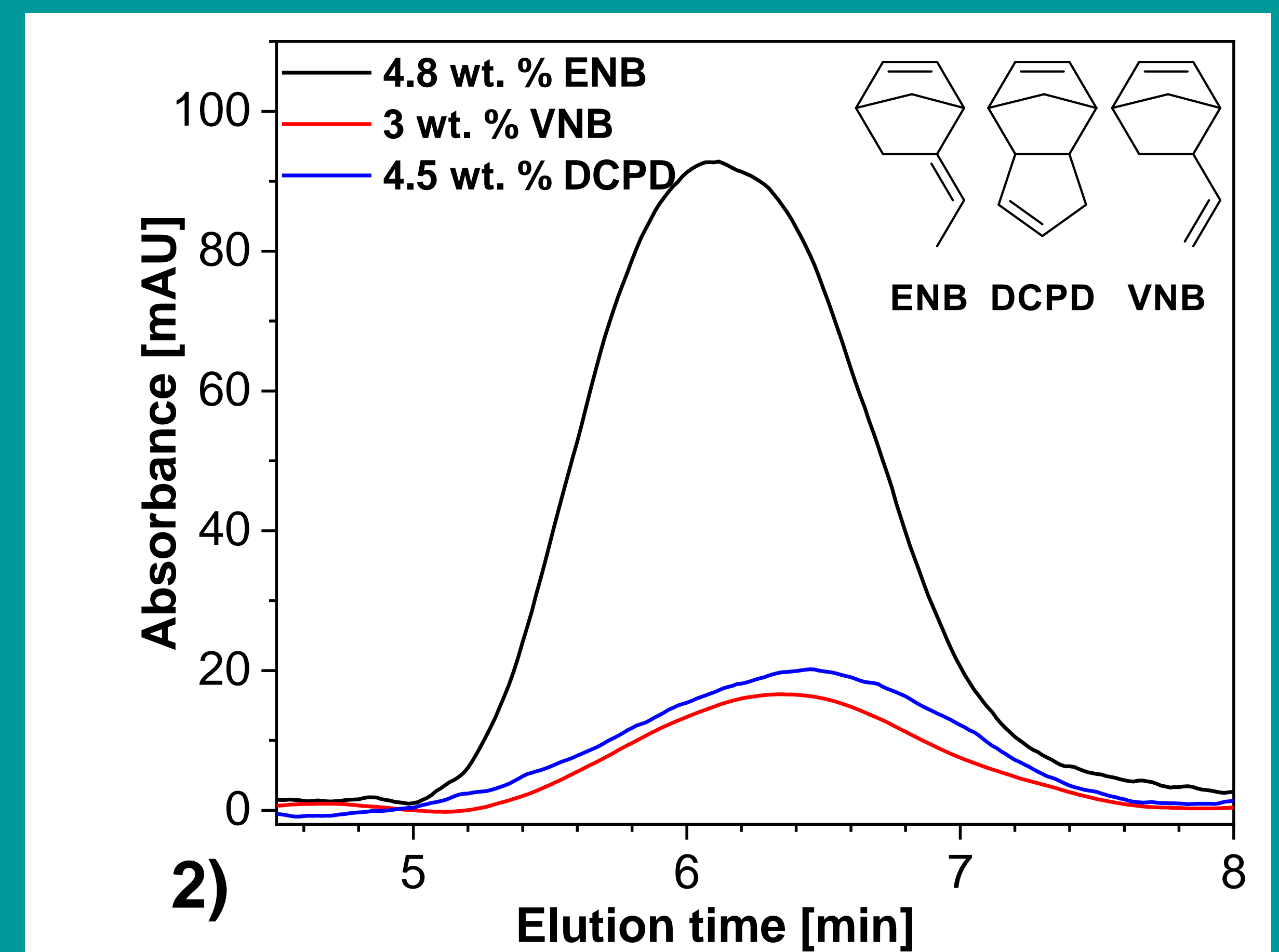
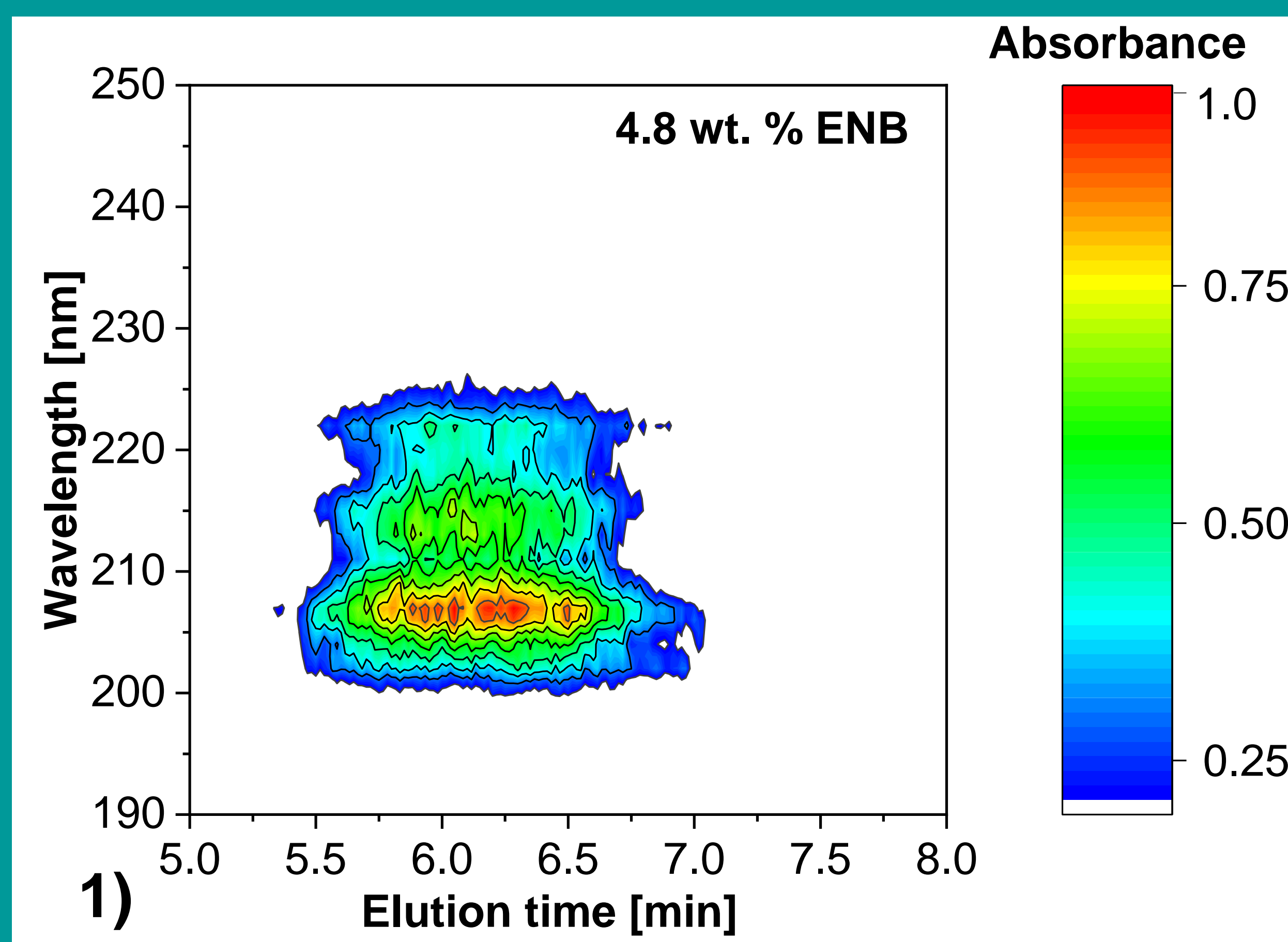
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## Abstract

The distribution of the pendant double bond along the molar mass axis impacts the vulcanization behavior of ethylene-propylene-diene (EPDM) terpolymers. Yet, the analysis of this parameter has so far been hampered by the lack of suitable detection methods. Towards this goal we have investigated the potential of UV detection for high temperature size exclusion chromatography of EPDM terpolymers containing 5-ethylidene-2-norbornene (ENB), dicyclopentadiene (DCPD), and vinyl norbornene (VNB) as termonomer. The influence of termonomer on the spectroscopic response was probed. EPDM containing ENB showed a significantly stronger UV-absorption compared to terpolymers with VNB and DCPD. Based on the results, a method was developed, which can profile the content of ENB along the molar mass axis. An evaporative light scattering detector (ELSD) was employed to monitor the analyte concentration, in combination with the UV detector, to quantitatively measure the distribution of ENB content along the molar mass distribution. This work could be feasible for the other two commercial relevant termonomers DCPD and VNB.

## Results



## Conclusion

- Double bond in ENB exhibits a UV absorbance in the 200-230 nm region with a maximum at 209 nm (**Figure 1**).
- Method extended to EPDM containing DCPD and vinyl norbornene VNB as comonomer
- Detector response for EPDM containing ENB significantly higher than that found where VNB or DCPD used and explained by ring strain present in the ENB comonomer (**Figure 2**).
- ELSD to monitor the analyte concentration in combination with the UV detector to measure the distribution of unsaturation along the molar mass axis.
- Applicability of the technique demonstrated by accurately determining the ENB distribution in EPDM terpolymers and polymer blends (**Figure 3a and 3b**).
- Potential to monitor polymers containing a UV chromophore, requiring high temperatures for dissolution, including the quantification of additives with a UV chromophore.

## Acknowledgement

The financial support of ARLANXEO Netherlands, B.V. is gratefully acknowledged. The authors thank Dr. Gerard van Doremaele (ARLANXEO Netherlands, B.V.) for useful discussions.

## Reference

Deshmukh, S., Brüll, R., Macko, T., Arndt, J.H., Bernardo, R., Niessen, S., 2022. Characterization of ethylene-propylene-diene terpolymers using high-temperature size exclusion chromatography coupled with an ultraviolet detector. *Polymer*, 242, p.124585.