

ADVANCED MICROANALYSIS OF FUNCTIONALIZED POLYOLEFINS TOWARDS INDUSTRIAL APPLICATIONS

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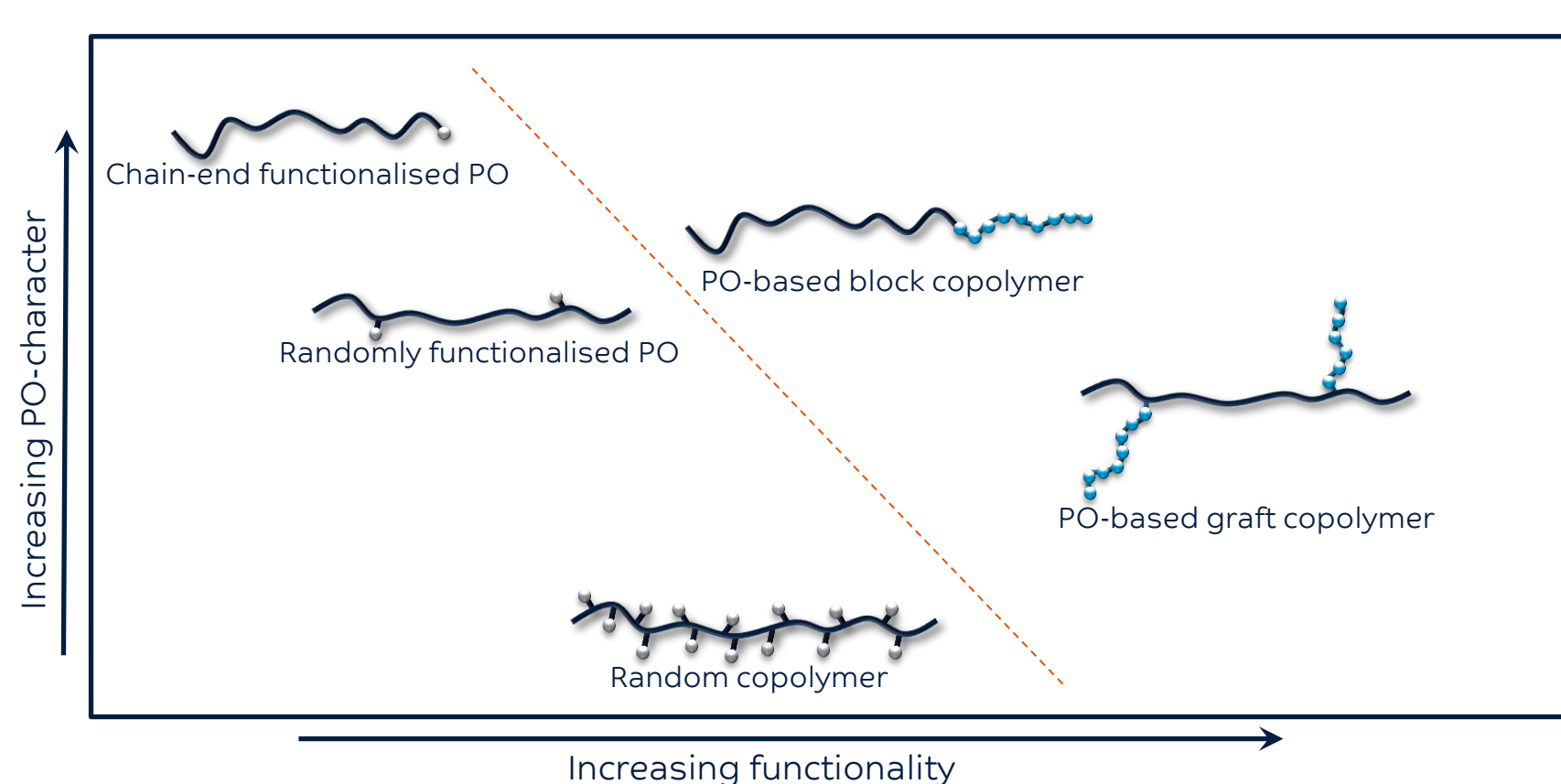
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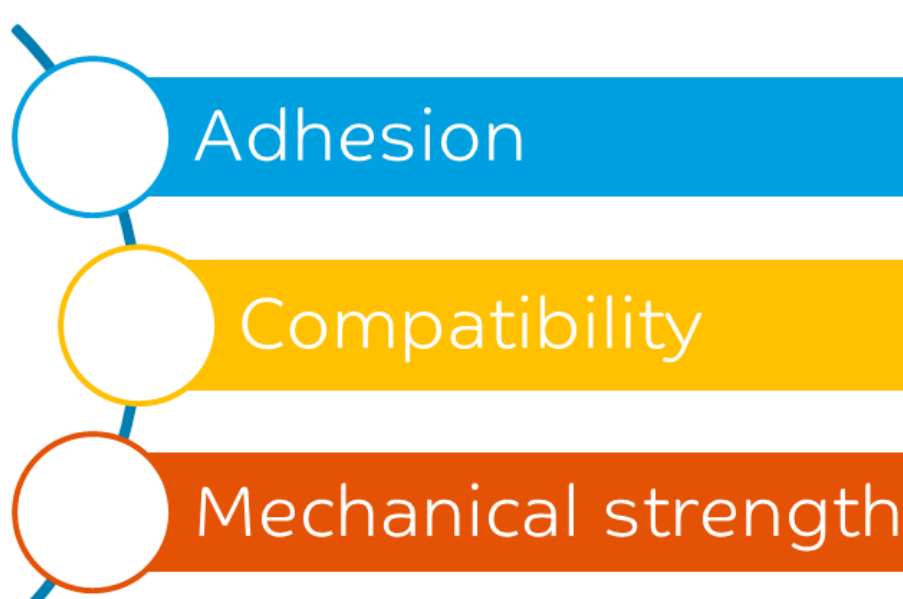
Introduction

Functional polyolefins (FPO) by catalysis

Incorporation of different functional groups into the PO backbone



Enhanced properties

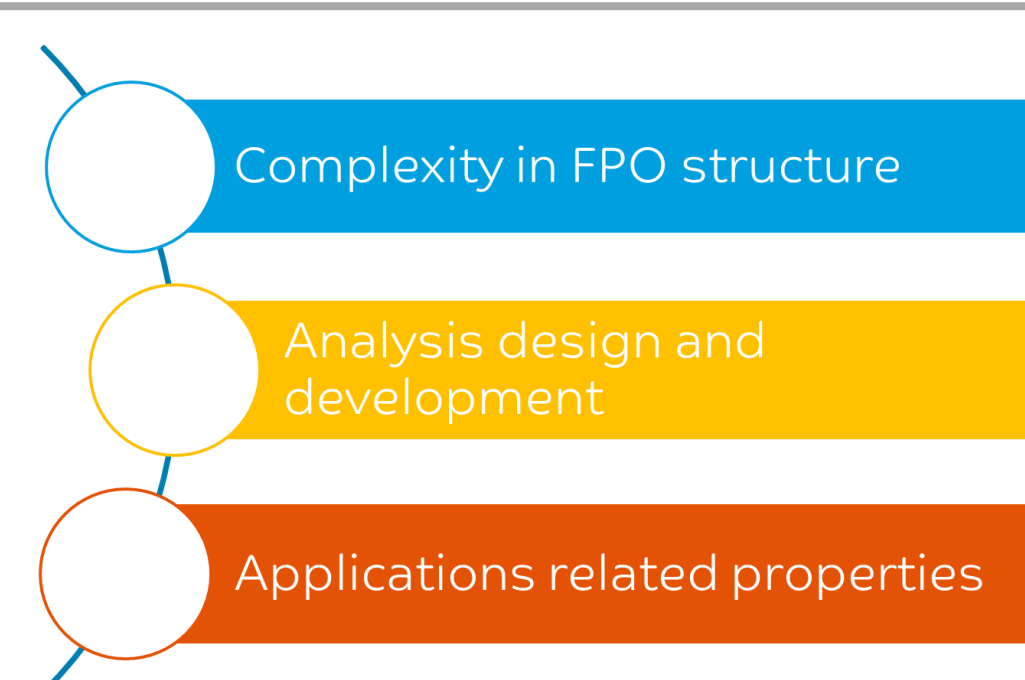


Extending Polyolefins Applications



Advanced Microanalysis for FPO

Challenges



GOALS

Develop various microscopy and microanalysis and provide analytical solution to support FPO materials optimizations.

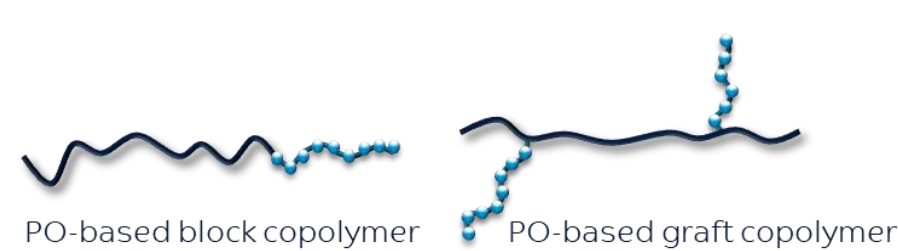
FPO structure / composition / morphology



Properties towards different industry applications

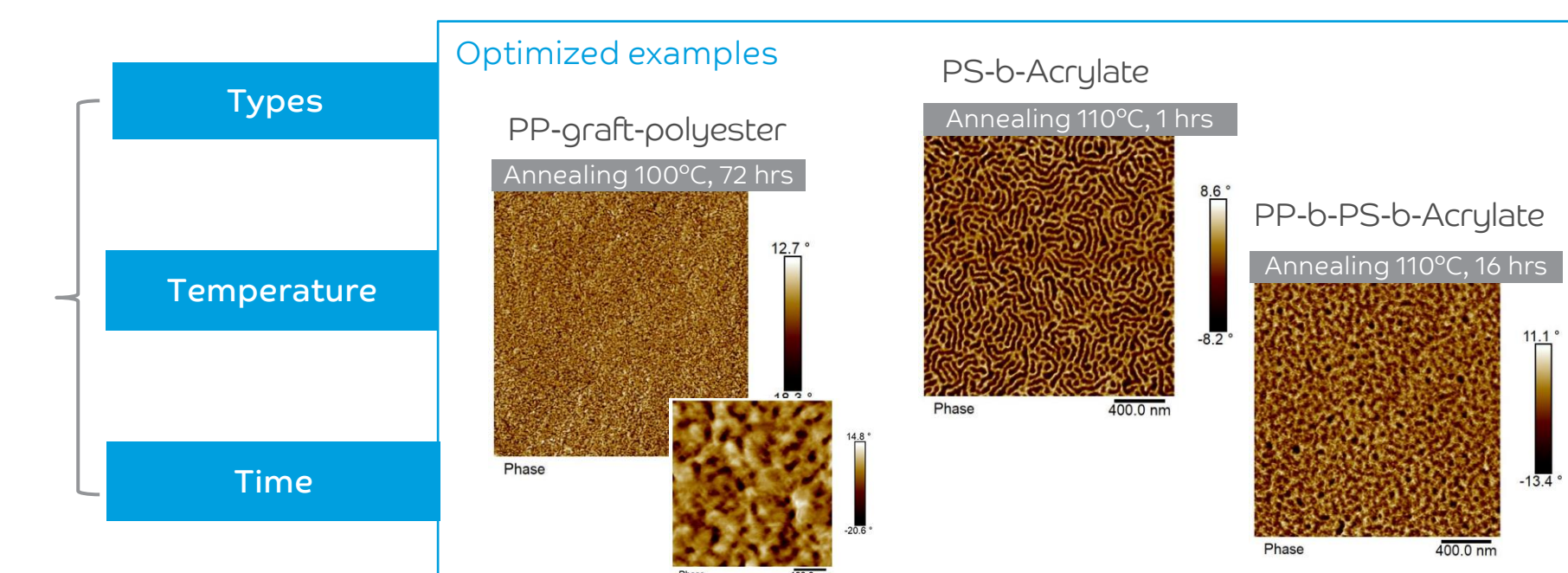
Results and Discussion

FPO based nano-porous membranes



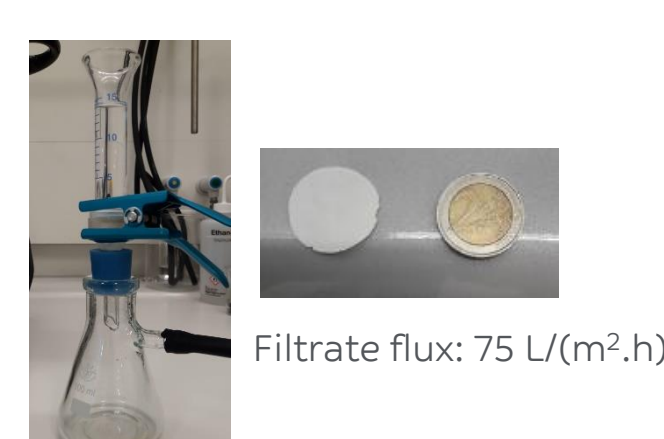
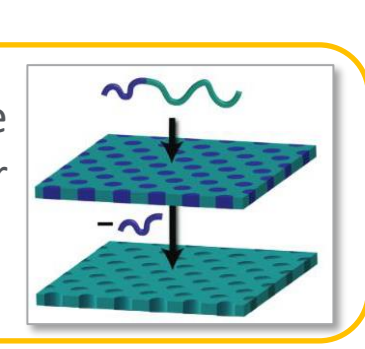
Microphase separation structure are important for understanding FPO based copolymer structure/properties relationship and their potential applications as filtration films and compatibilizers.

Annealing studies on various FPO based co-polymers



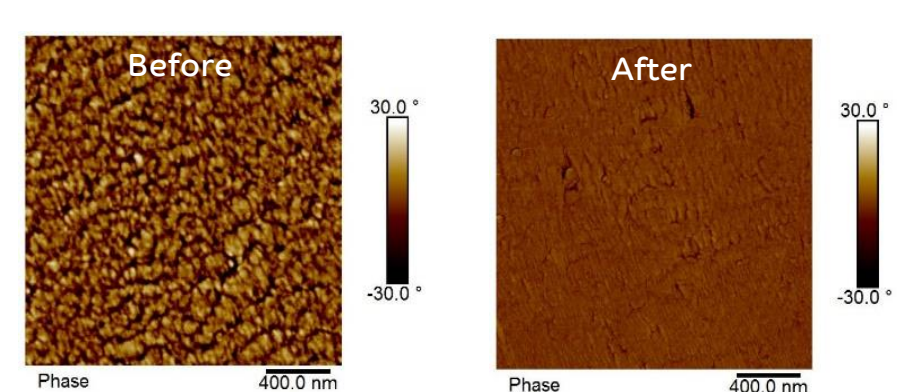
Identify copolymer composition and processing optimizations towards applications

PP-g-polyester based material via microphase separation and polyester phase degradation for water filtration applications [1]

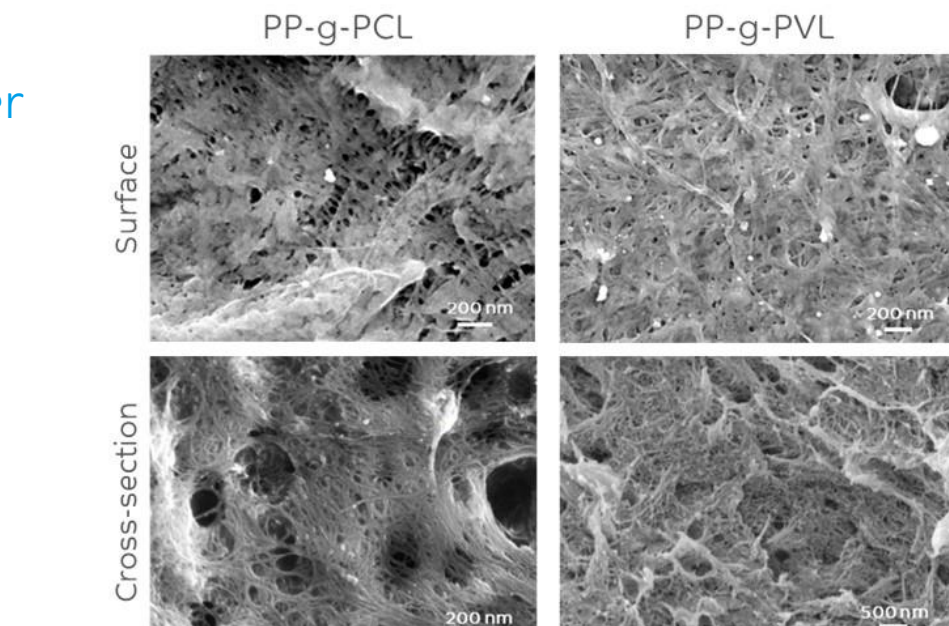


Recommendation on Composition via Annealing Study

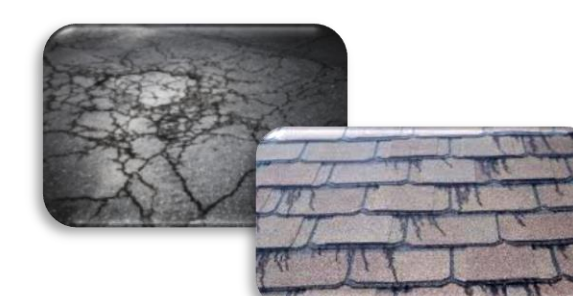
Confirmation of Degradation of Polyester Phase



Microscopy Method for Nano-porous Membrane Evaluations

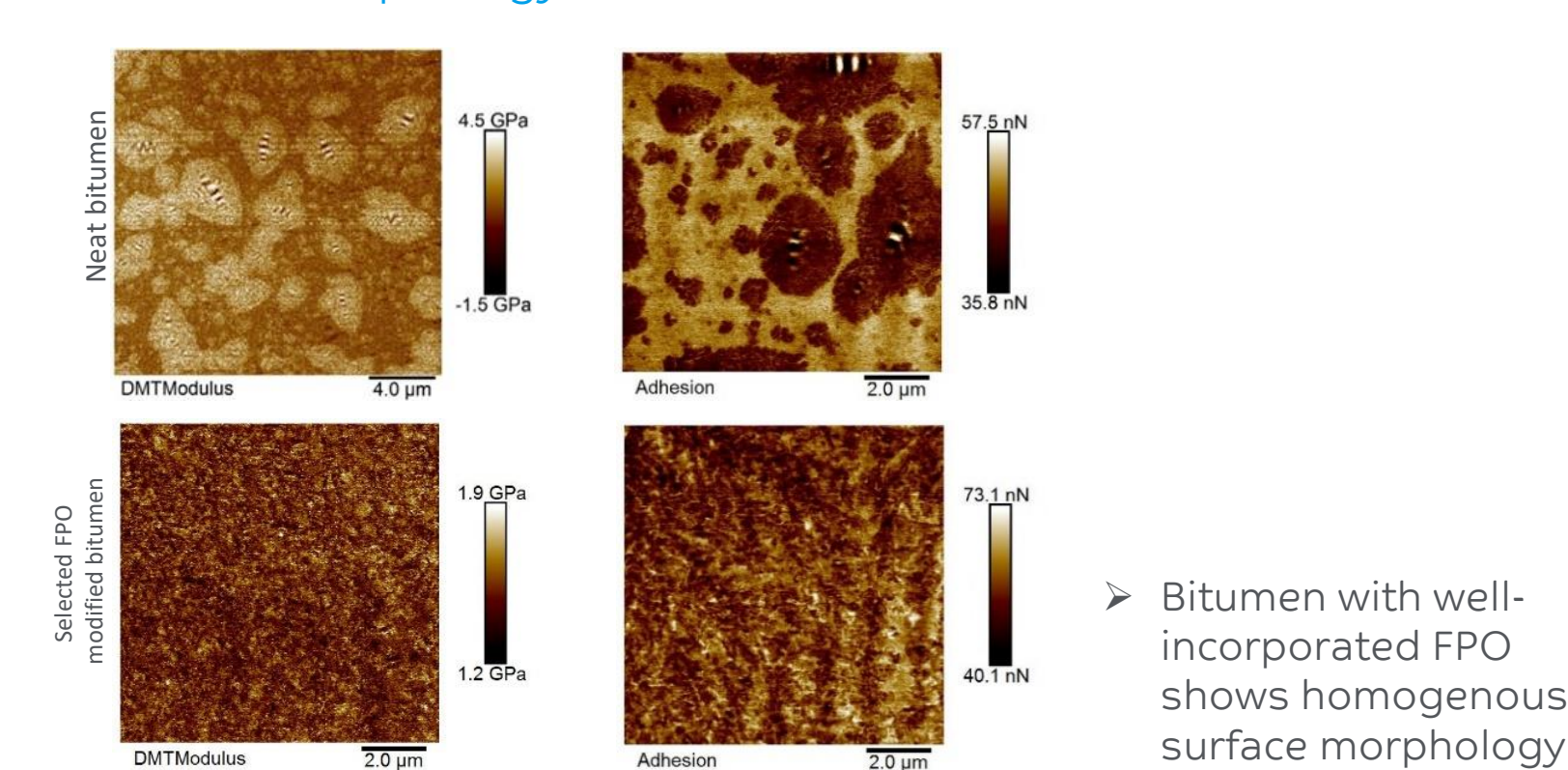


FPO as bitumen modifier



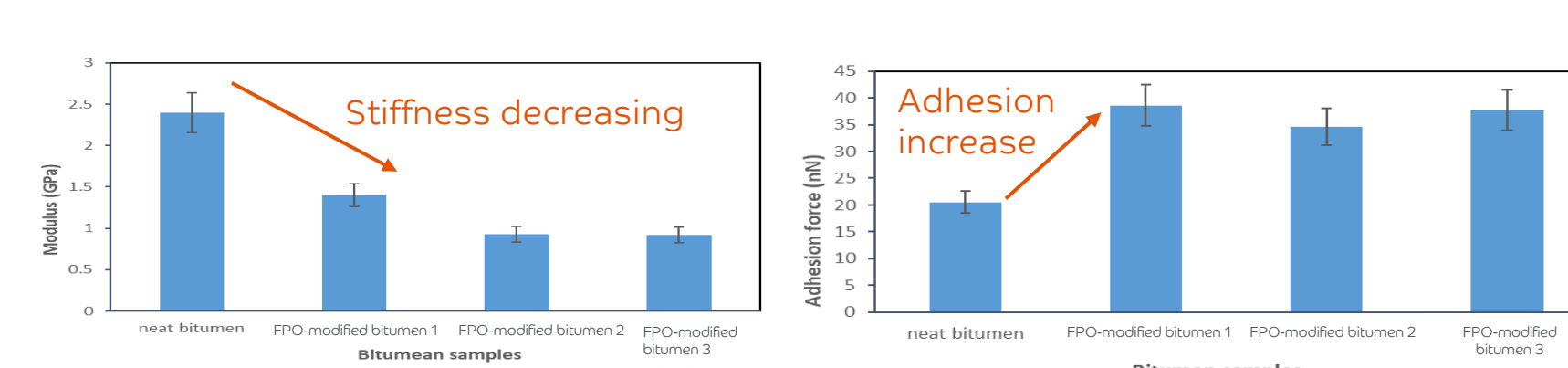
Developing FPO as bitumen modifiers to further improve the elasticity, adhesion and stability of PP modified bitumen and reducing the cost [2].

Surface Morphology

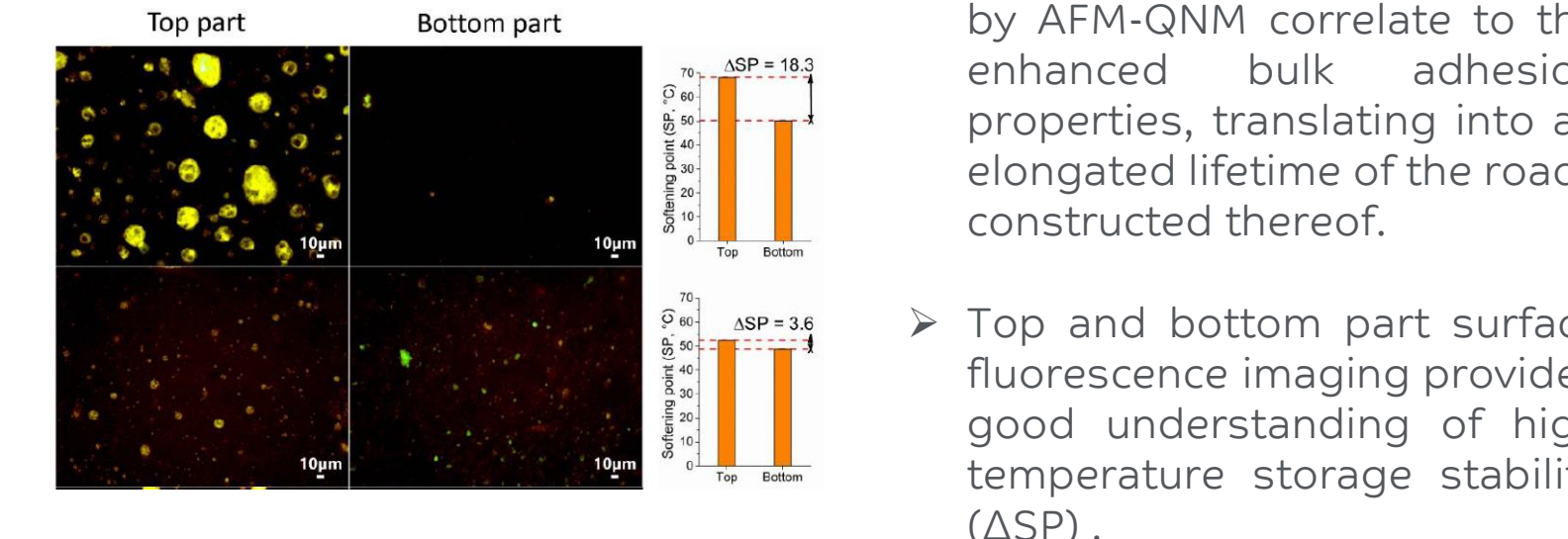


Bitumen with well-incorporated FPO shows homogenous surface morphology

Surface Nano-mechanical Properties



Surface Fluorescence



Nano-mechanical properties by AFM-QNM correlate to the enhanced bulk adhesion properties, translating into an elongated lifetime of the roads constructed thereof.

Top and bottom part surface fluorescence imaging provides good understanding of high temperature storage stability (ASP).

Conclusions

- Microanalysis provides valuable information on FPO structure, composition and morphology.
- Contributes to solve the main challenges of designing and develop FPO towards different applications.

Reference

[1] T. Defize, M. Bouyahyi, A. Rozanski, L. Yang, B. Patham, T. Sweere, S. Hochstädt, M. Hansen, K. Bernaerts, L. Jasinska-Walc, R. Duchateau; ACS Appl. Polym. Mater., 2022, 4, 6897–6907.

[2] M. Malus, J. Bojda, M. Sienkiewicz, M. Bouyahyi, L. Yang, F. Navarro, M. Soliman, R. Duchateau, L. Jasinska-Walc, Construction and Building Materials, 2023, 390, 131630