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Inline monitoring of particle size in emulsion polymerization processes by Photon Density Wave (DPW) Spectroscopy



NANOPAT:

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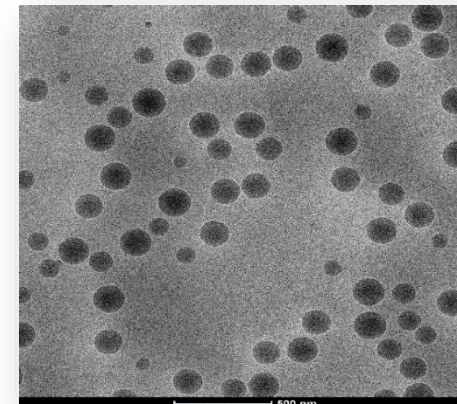
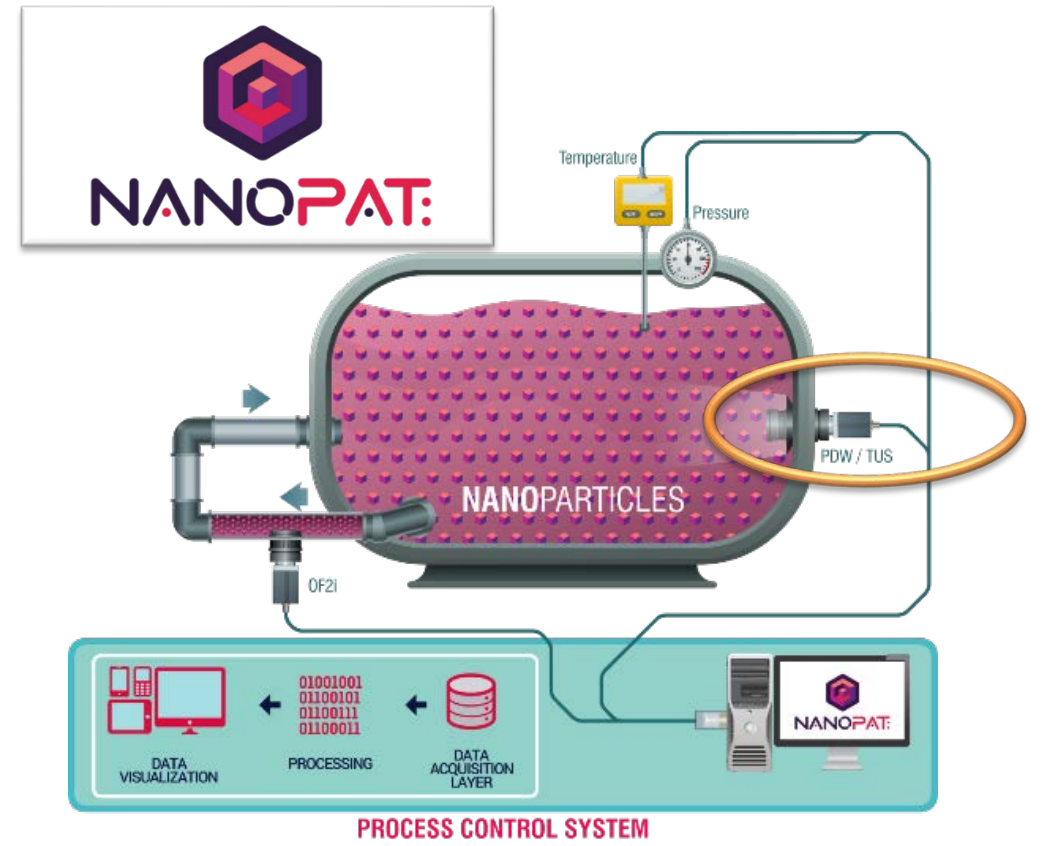
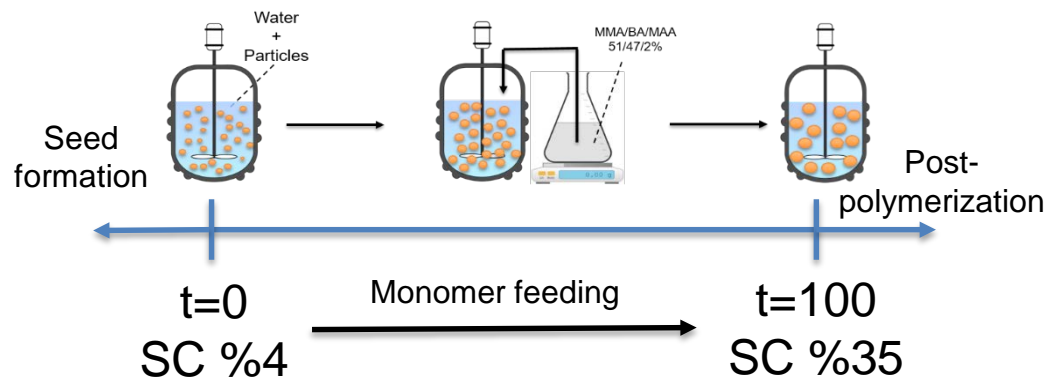
Project overview

NanoPAT European Project: Application of three new real-time analytical tools for particle size (dp) and particle size distribution (PSD) in-line or on-line monitoring.

Present Work objective: Assessing Photon Density Wave (PDW) spectroscopy analysis method as in-line monitoring technique in emulsion polymerization processes.

Polyacrylate latex synthesis

Emulsion polymerization process



CryoTEM image for final latex ($t=130\text{min}$). Scale: white line in the base of the figure=500nm

PDW background

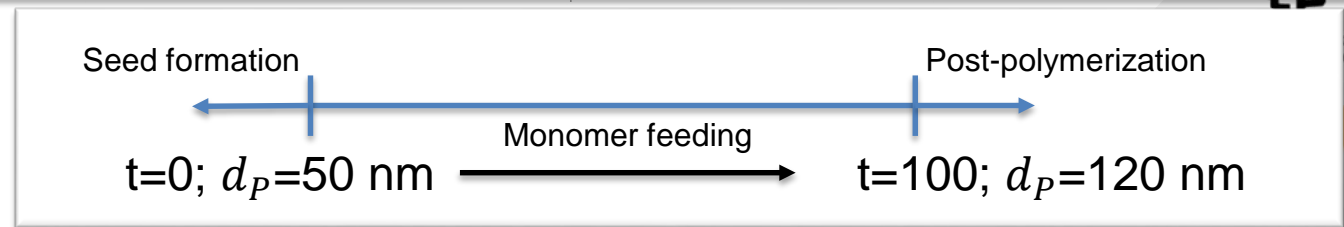
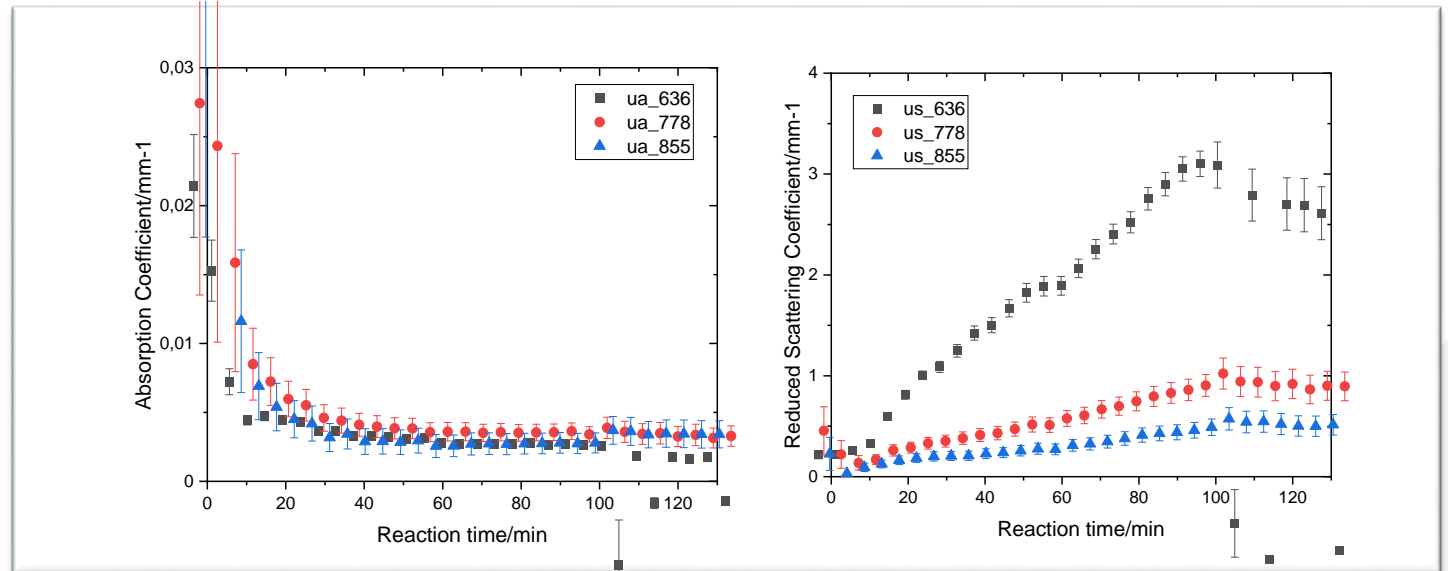
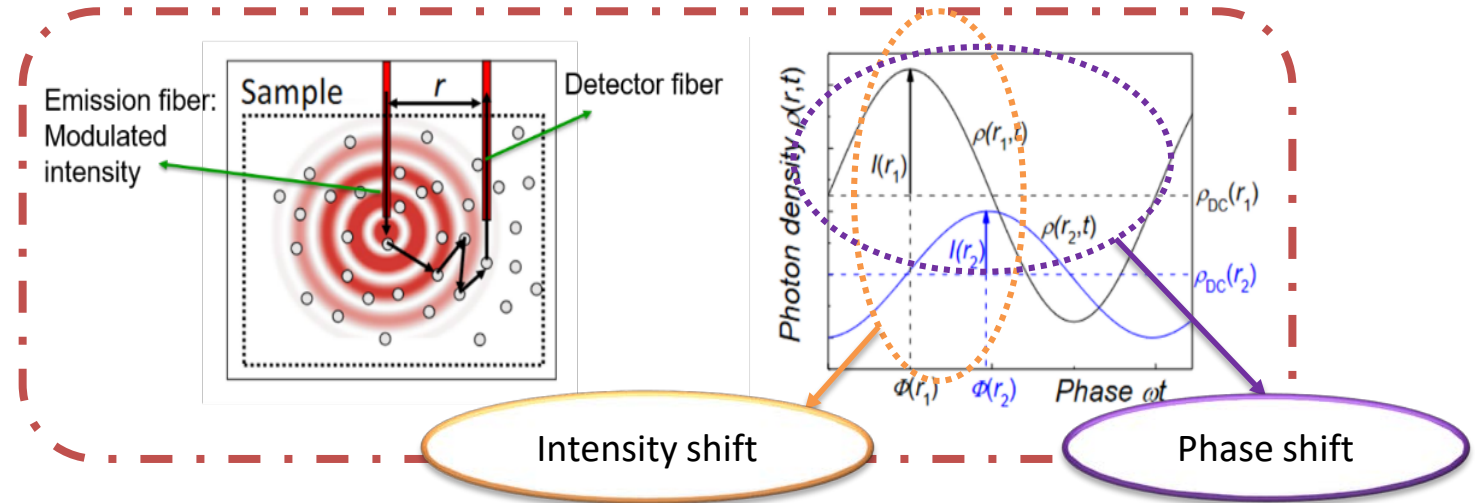
Phase shift (k_ϕ)
Intensity shift (k_I)



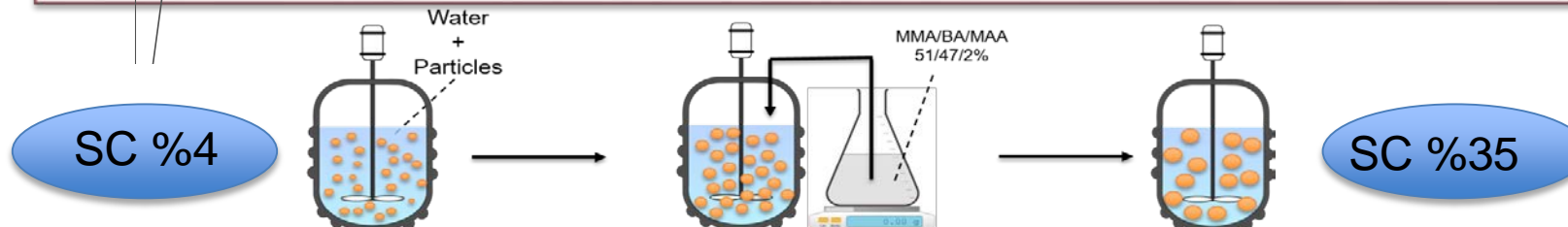
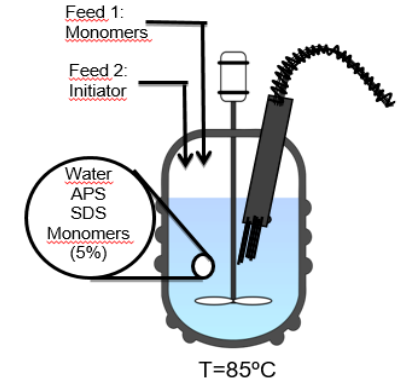
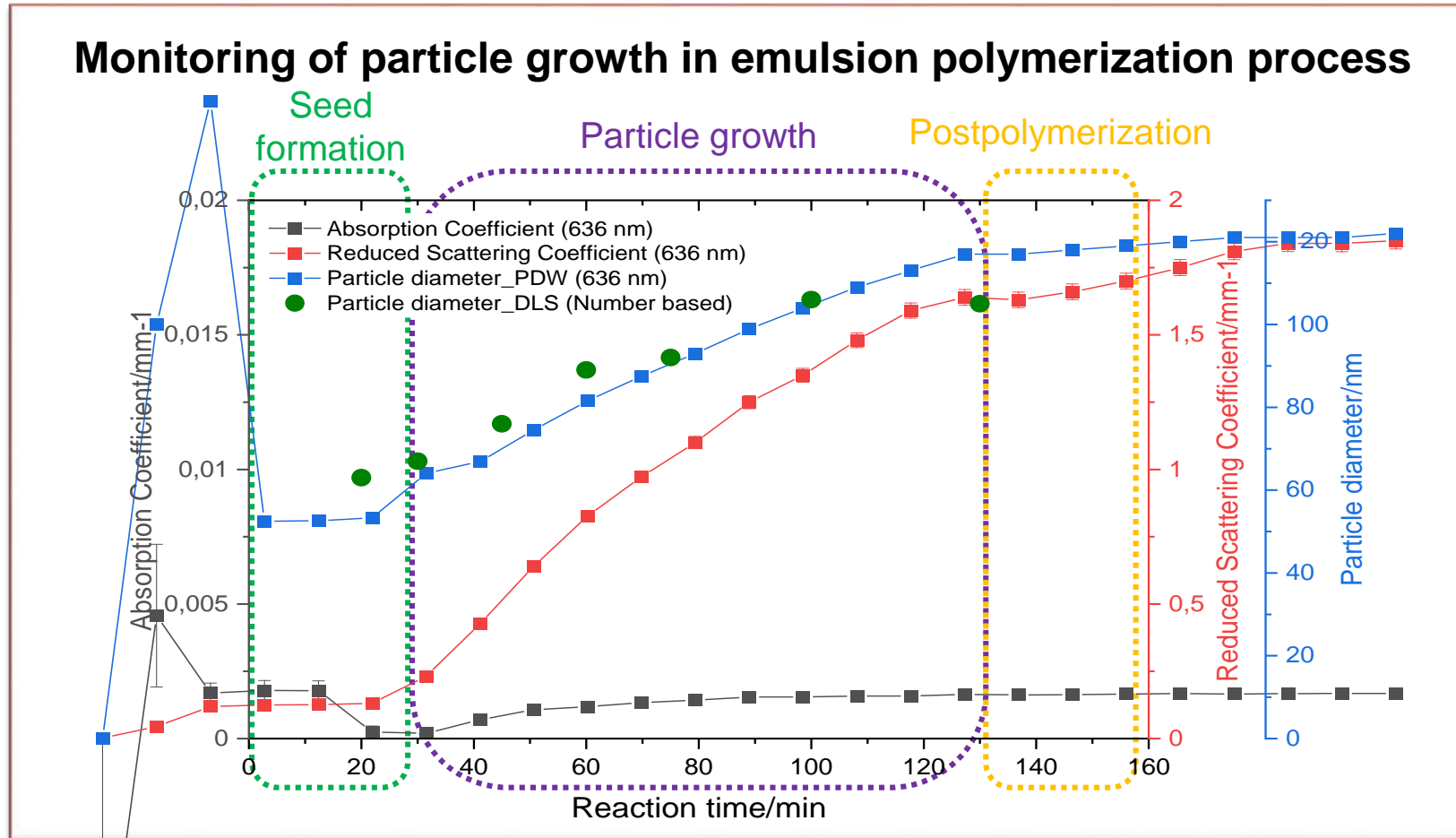
Absorption Coefficient (μ_a)
Reduced Scattering Coefficient (μ'_s)



Particle diameter (d_p)
(Particle size distribution. PSD)



Application & Results. Inline analysis



Poster reference



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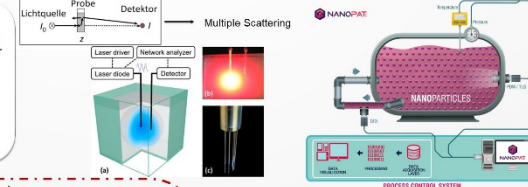
Authors: U.O. Aspiazú, M. Münzberg, J.R. Leiza, M. Paulis

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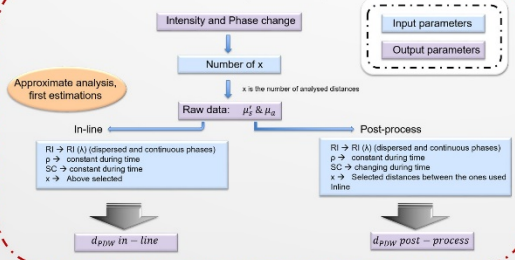
INTRODUCTION

NanoPAT European Project objective: Application of three new real-time analytical tools that overcome problems and limitations of conventional characterisation technologies for particle size (dp) and particle size distribution (PSD) in-line or on-line monitoring.

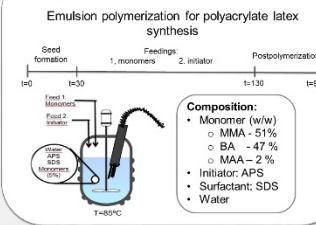
Present Work objective: Assessing Photon Density Wave (PDW) spectroscopy analysis method as in-line monitoring technique in emulsion polymerization processes.



In-line & Post-process analysis

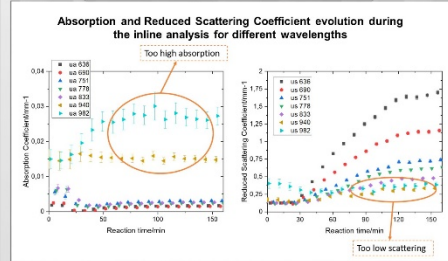


Analysed process:

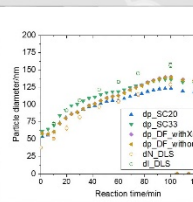
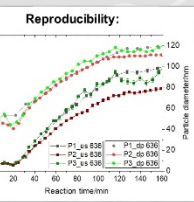
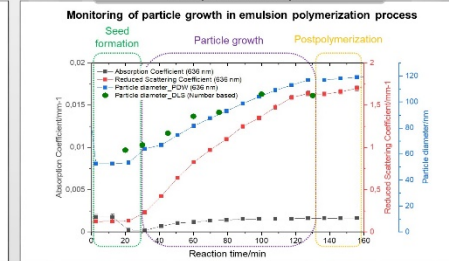


RESULTS & DISCUSSION

In-line analysis



Post-process analysis



1. RI + p of polymer.
2. RI of polymer and p of the monomer.
3. RI + p of monomer.
4. RI of monomer and p of polymer.
5. Particle composition of 90 % polymer and 10% monomer; RI + p of 90 % polymer and 10 % of monomer.

Conclusions: Accurate monitoring of particle size during polyacrylate latex synthesis. Good matching of inline measured particle size with offline DLS measurements. Good reproducibility of results. Negligible effect of monomer density for the analysed system. High impact of monomer RI in the analysed system.

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P D W
ANALYTICS

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