POLYMAT

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

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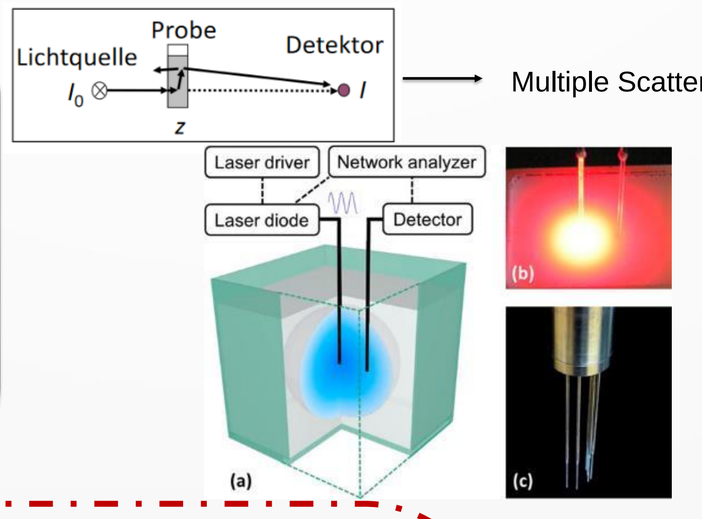
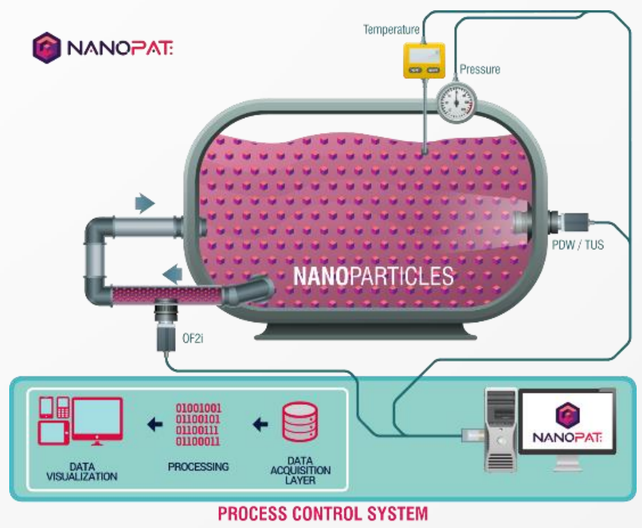
• INTRODUCTION •

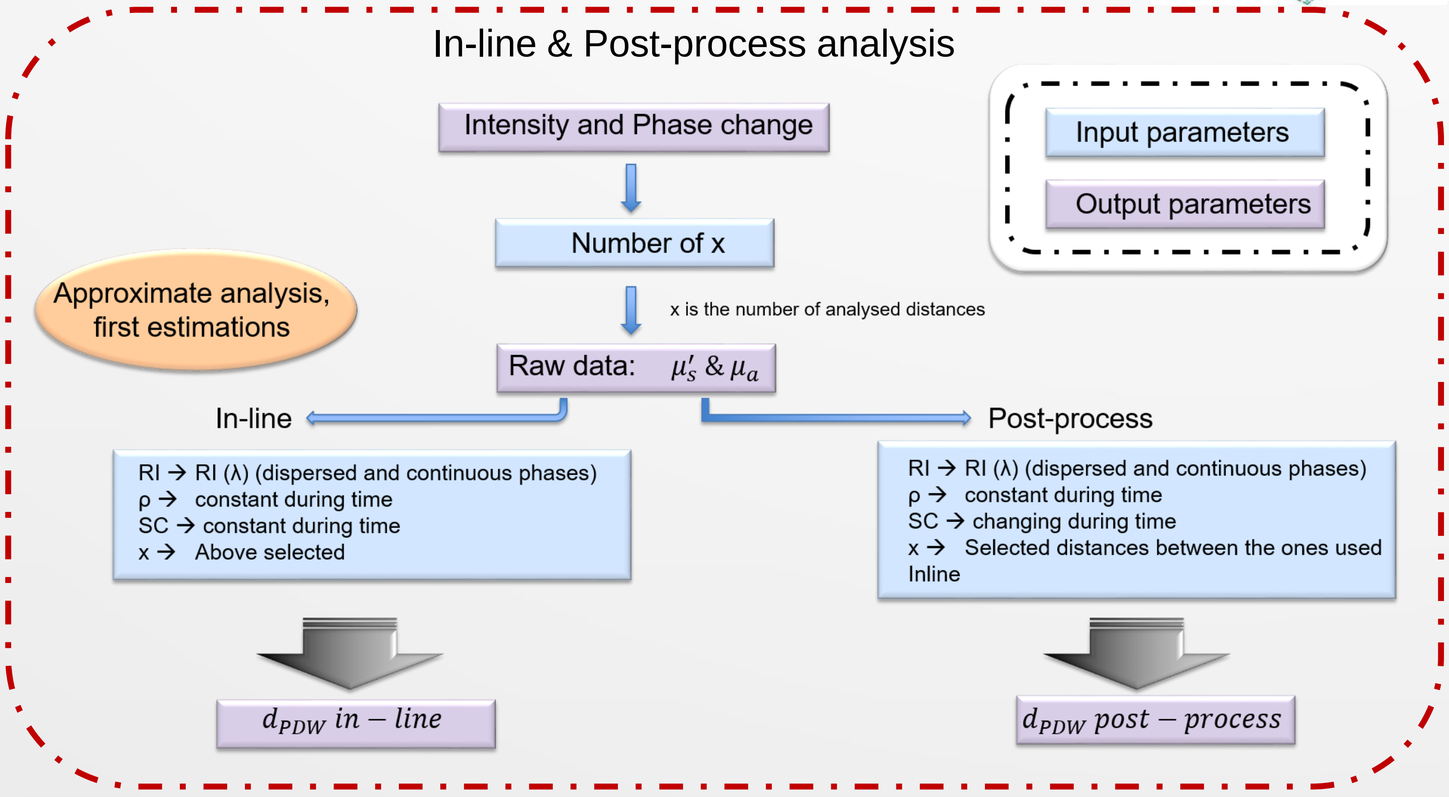
NanoPAT European Project objective: Application of three new real-time analytical tools that overcome problems and limitations of conventional characterisation technologies for particle size (dp) and particle size distribution (PSD) in-line or on-line monitoring.

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



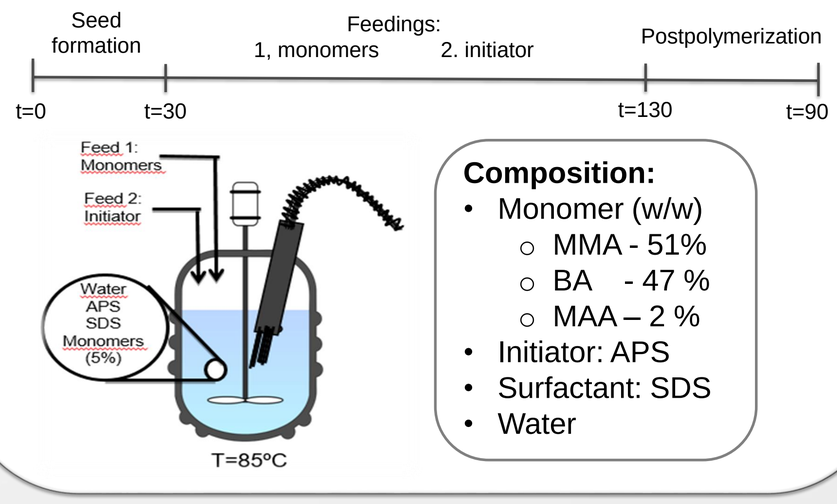


In-line & Post-process analysis



Analysed process:

Emulsion polymerization for polyacrylate latex synthesis

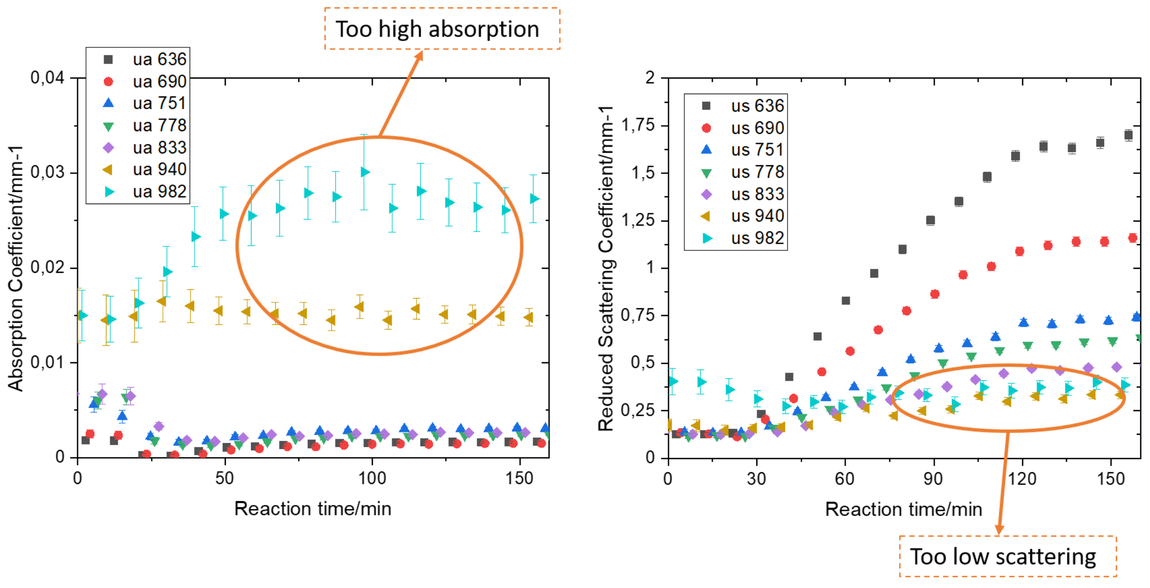


Composition:
- Monomer (w/w)
  - MMA - 51%
  - BA - 47 %
  - MAA – 2 %
- Initiator: APS
- Surfactant: SDS
- Water

• RESULTS & DISCUSSION •

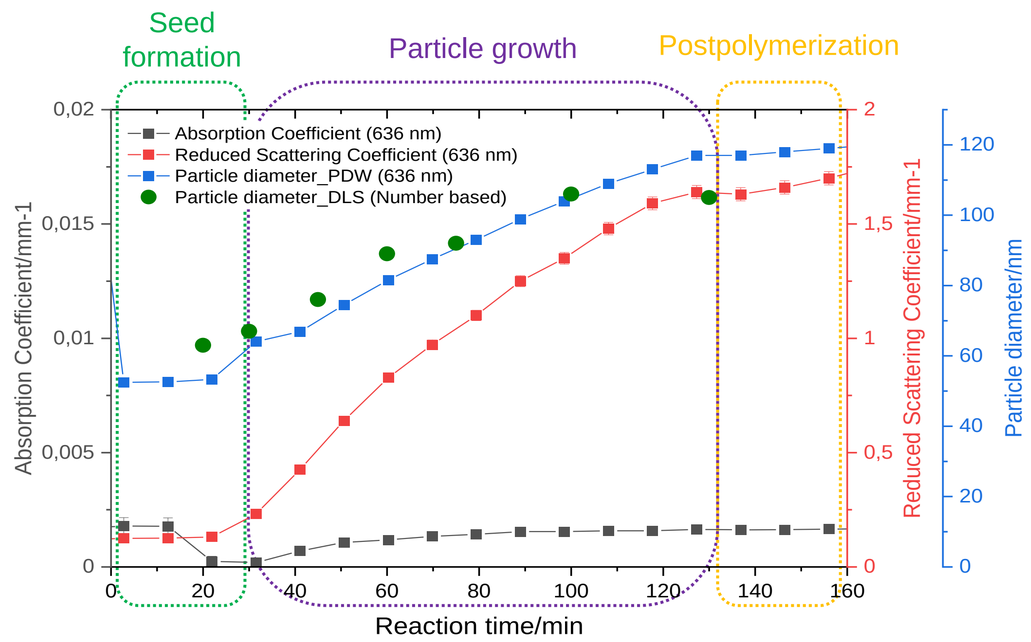
In-line analysis

Absorption and Reduced Scattering Coefficient evolution during the inline analysis for different wavelengths

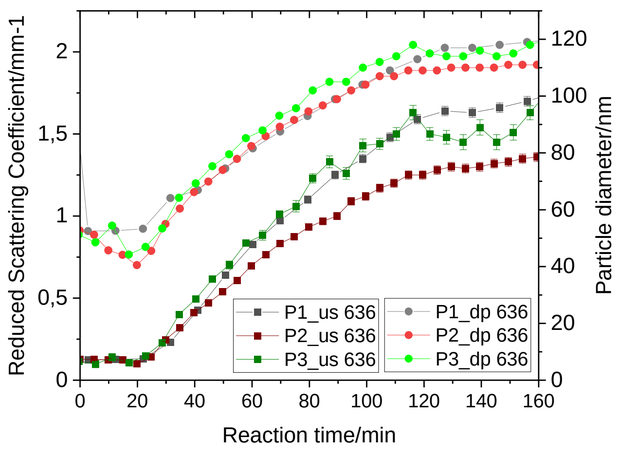


Post-process analysis

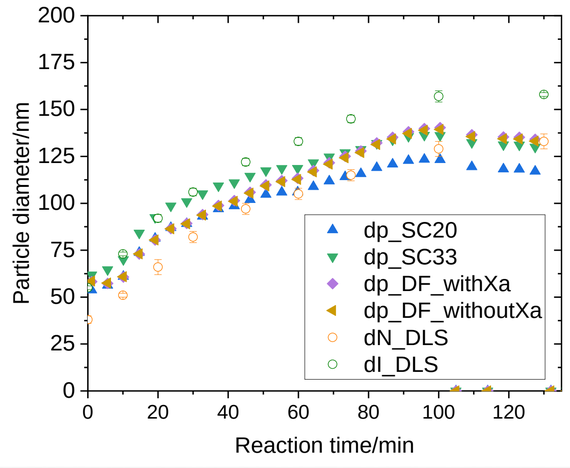
Monitoring of particle growth in emulsion polymerization process

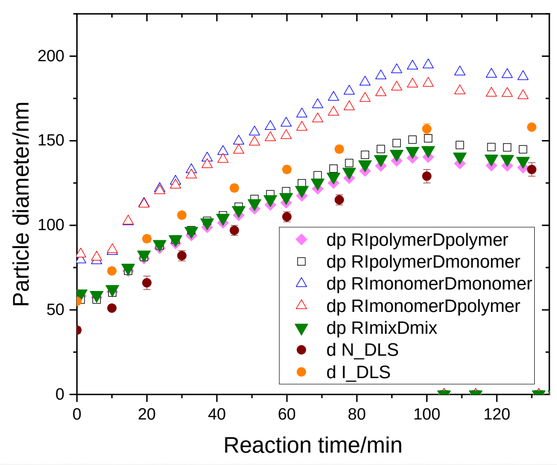


Reproducibility:



Post-process parameter analysis:





1. RI + ρ of polymer.
2. RI of polymer and ρ of the monomer.
3. RI + ρ of monomer.
4. RI of monomer and ρ of polymer.
5. Particle composition of 90 % polymer and 10% monomer. RI + ρ 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 anlayed system.

Acknowledgment

NANOPAT
PDW ANALYTICS
innoFSPEC Innovative faseroptische Spektroskopie und Sensorik