

Technologies for continuous demolding processes



Targets:

- Technology comparison of existing and novel processes for the application of release layers
- Quick procedure for determining the right release agent
- Reduction of setup work and material usage when coating release metal sheets for continuous compression systems (CCM)

Methods:

- Determination of the dynamic surface tension using a bubble pressure tensiometer to determine the application method
- Contact angle measurements according to DIN 55660 to determine surface energetics
- Calculation of interfacial tension according to Owens, Wendt, Rabel, Kaelble (OWRK) as adhesion criterion for demolding processes
- Release agent application via
 - Spray application
 - Wiping
 - Plasma polymer coatings
- Repeated static and dynamic demolding of thermoplastic materials on coated metallic substrates

Results:

- Development of a rapid experimental approach for validation and determination of suitable release agents by using contact angle measurements and mathematical approaches
- Naming of release agents (like HMDSO) for repetitive release operations in the CCM process for polar and non-polar thermoplastic polymers
- Realization of up to 50 demoldings with efficient release technologies
- Illustration of the influence of the curing process of the release layer under different conditions
- Reduction of the curing process (according to TDS) from 30 to 5 minutes due to a higher thermal energy input (250°C)
- Comparison of the different processes and designation of a preferred technology -> Plasma polymer coating for repetitive demolding with a slight peeling motion

Outlook:

- Reduction of the manual effort for the order and thus saving of material as well as human resources
- Further development of release coatings using plasma polymer coatings for application in the CCM process
- Further cooperation with suppliers of release agents to switch to water-based release agents in the sense of an environmentally compatible substitution

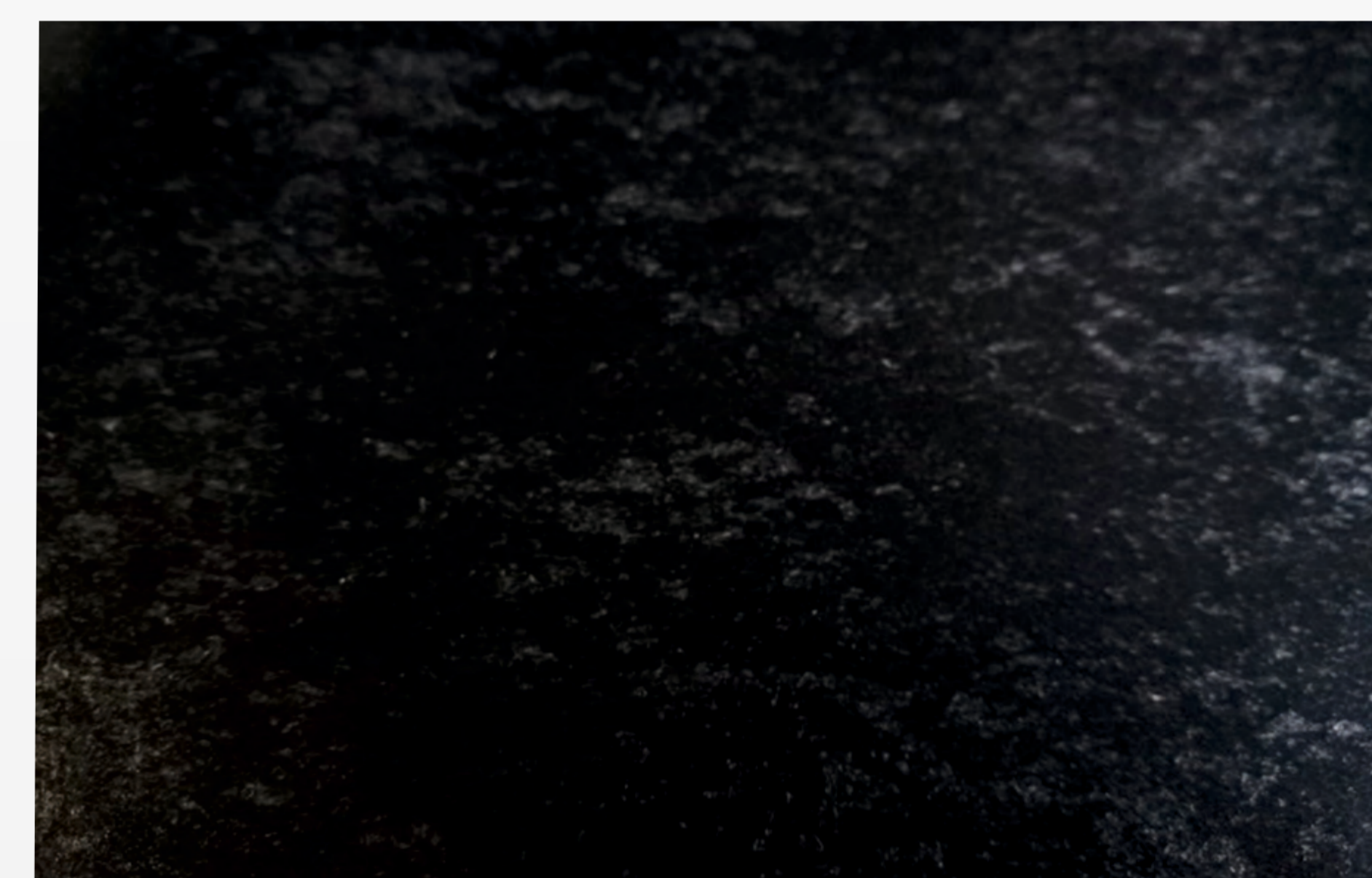


Fig. 1: Demolding errors due to the use of the wrong release agent (rough surface and material chipping) result to lower properties of composite materials

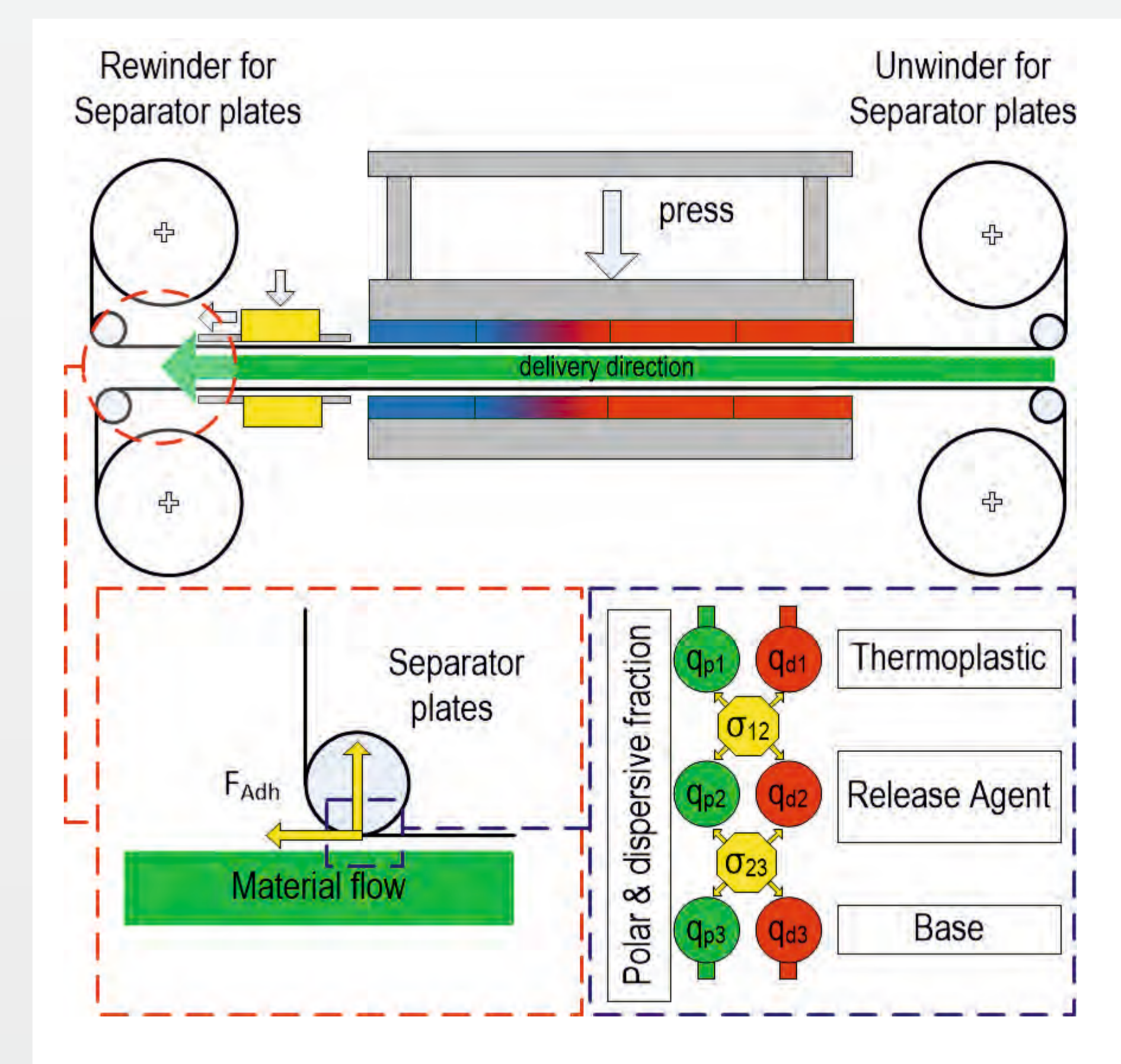


Fig. 2: Process diagram and adhesion mechanisms in CCM Technology

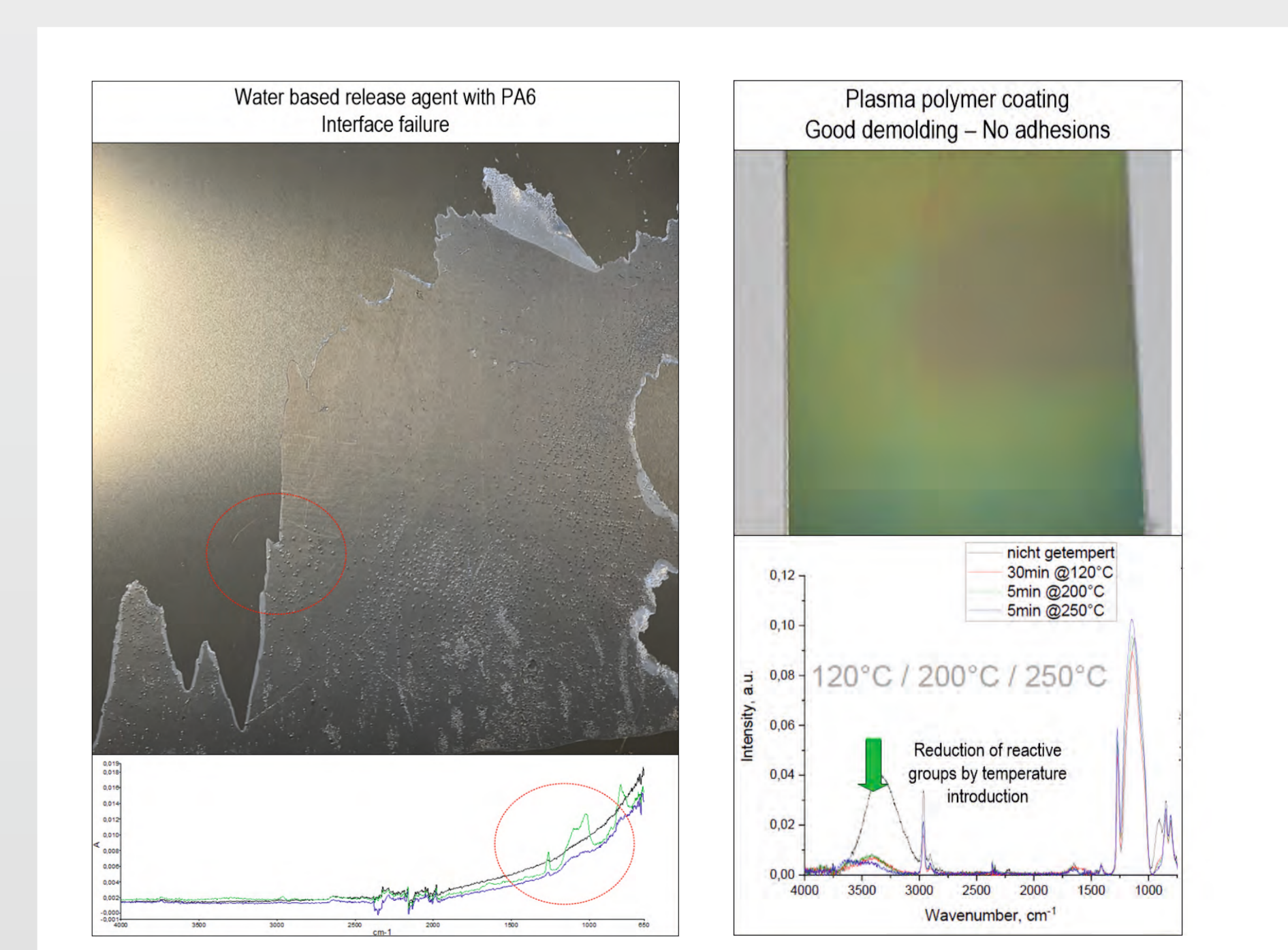


Fig 3: Influence of the release agent selection and processing conditions on the release effect and representation of the surface quality by IR-spectroscopy