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Pre-packaging of power components using photosensitive resin

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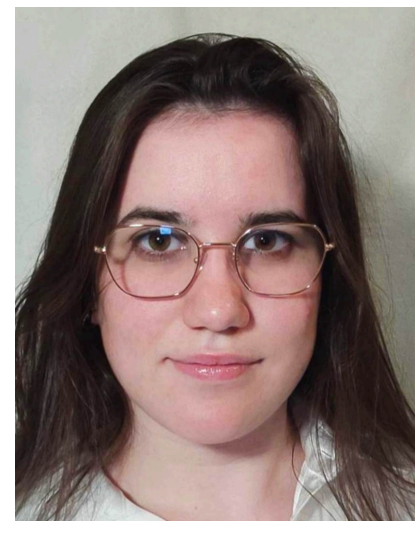
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Pre-packaging of power components using photosensitive resin

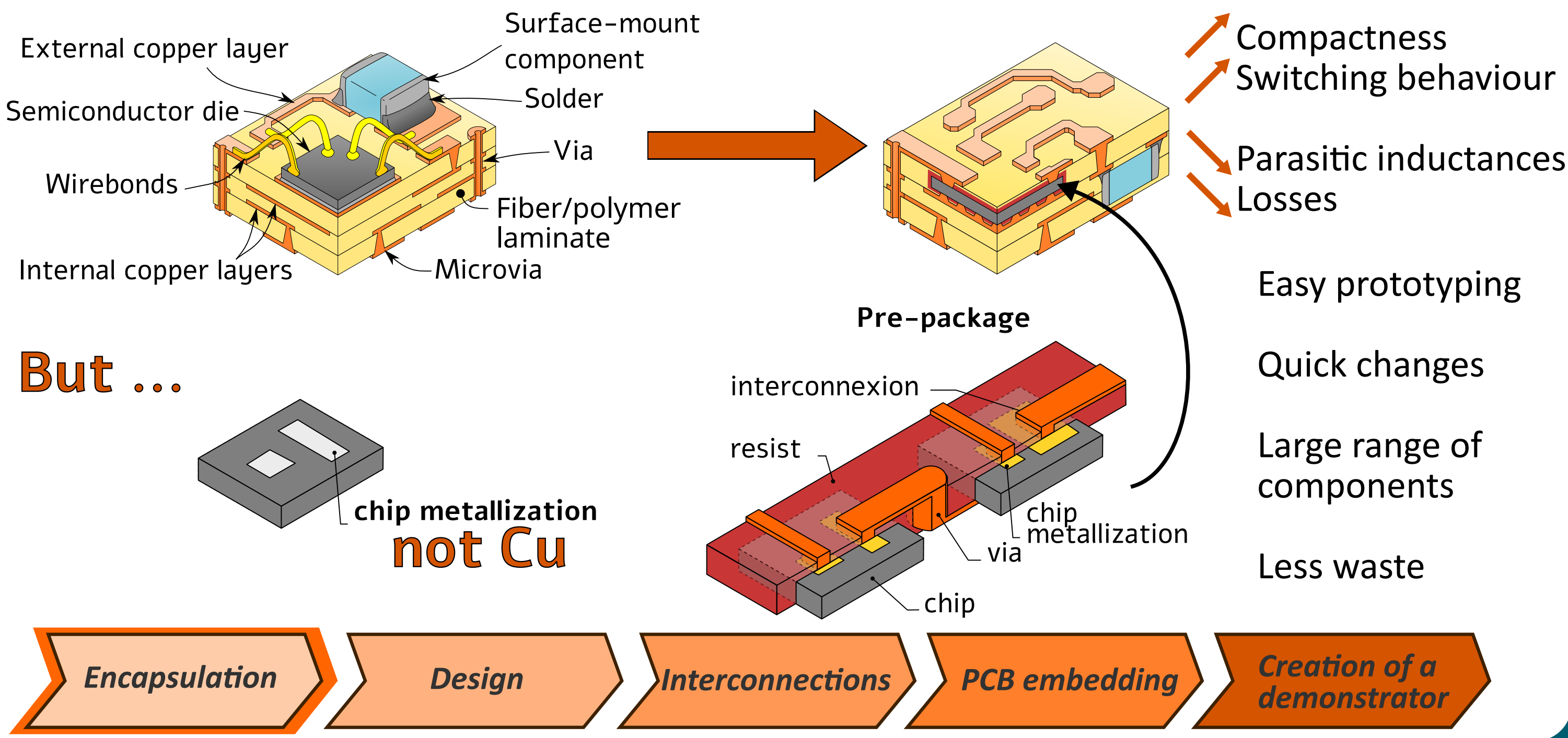
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Encapsulation and pre-package



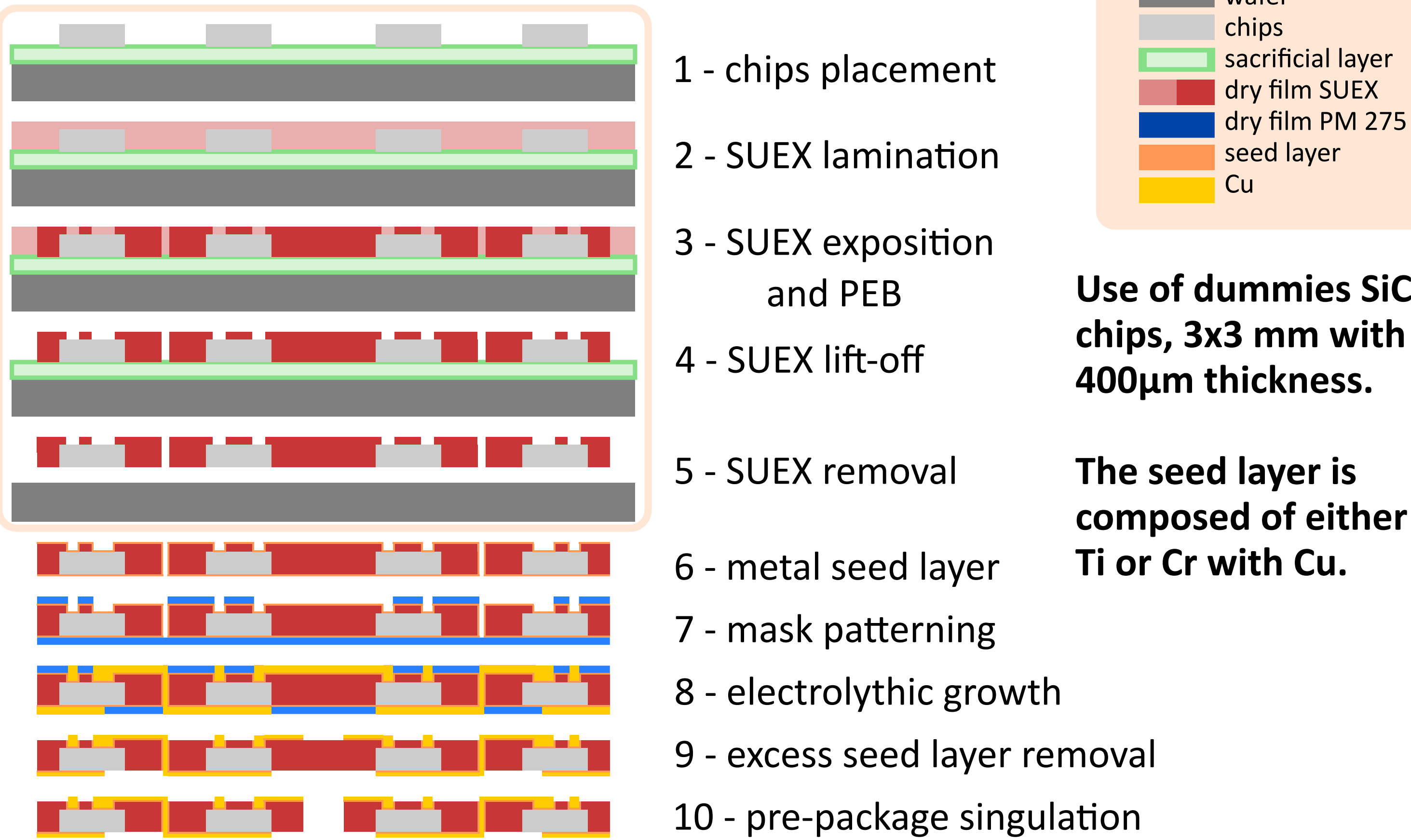
Power component encapsulation specifications

Service function	Assessment criterion	Acceptability level
Encapsulate components	<ul style="list-style-type: none"> Conformal deposition Deposit thickness 	<ul style="list-style-type: none"> Presence of some bubbles tolerated 500µm
Reduce production costs	<ul style="list-style-type: none"> Simplified tooling Batch process 	<ul style="list-style-type: none"> Photolithography techniques
Ensure connectivity with the external environment	<ul style="list-style-type: none"> Access to inferior and superior component's faces Encapsulation opening on the upper surface 	<ul style="list-style-type: none"> Full overlap of component edge Photosensitive material
Exterior working environment requirements	<ul style="list-style-type: none"> Thermal stability Dielectric strength Pressure 	<ul style="list-style-type: none"> 150°C fonct / 200°C emdding $E_{crit} = 10kV/mm$ 2 bar

Encapsulated resin selected: **SUEX thick dry films (DJ Laminates)**

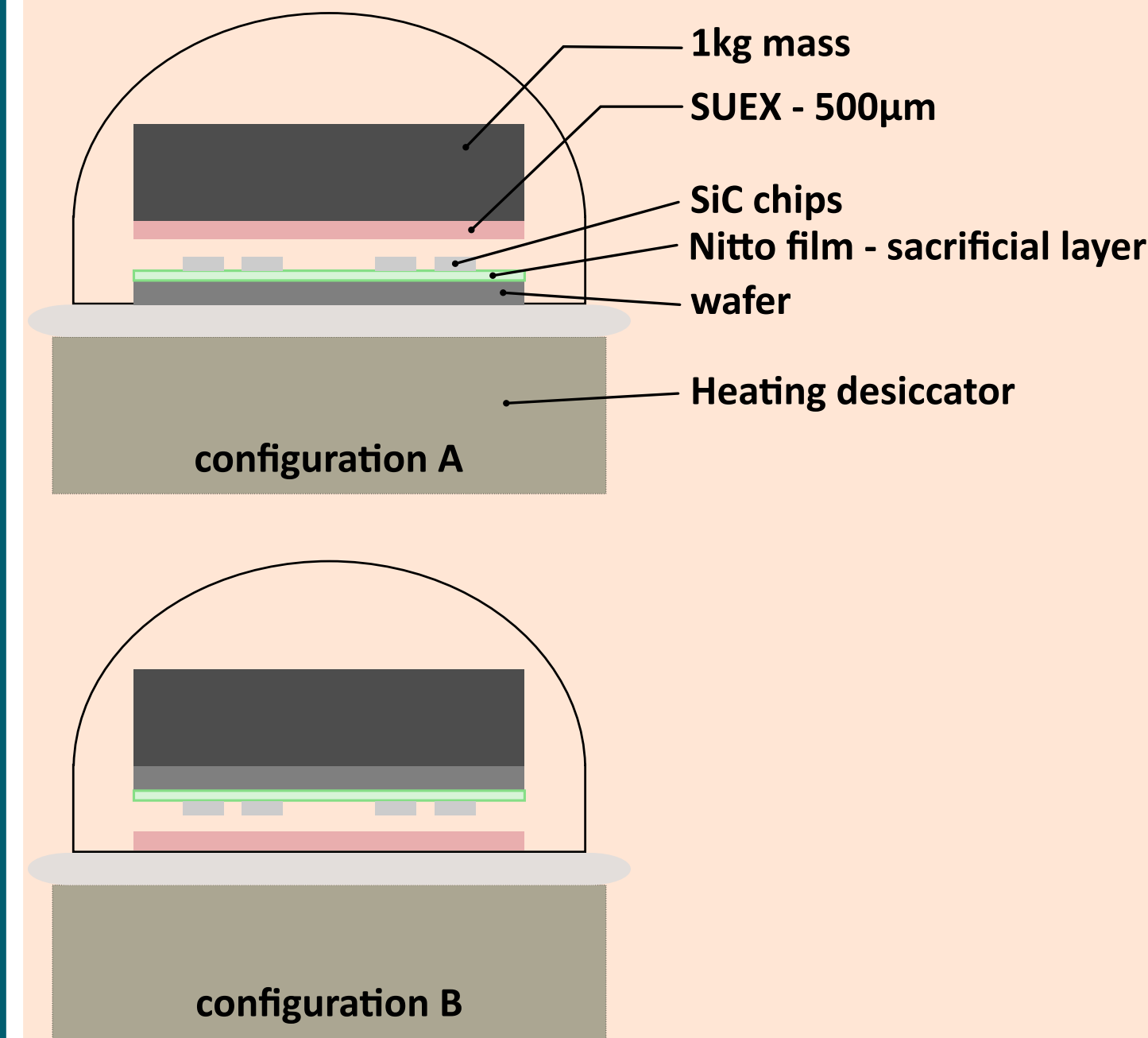
Envisaged process for pre-packages fabrication

SUEX 500µm : dry film negative resin



Methodology

Testing two configurations for SUEX lamination



heating speed: slow (20min ramp-up, 10min soak)
fast (5min ramp-up, 1min soak)

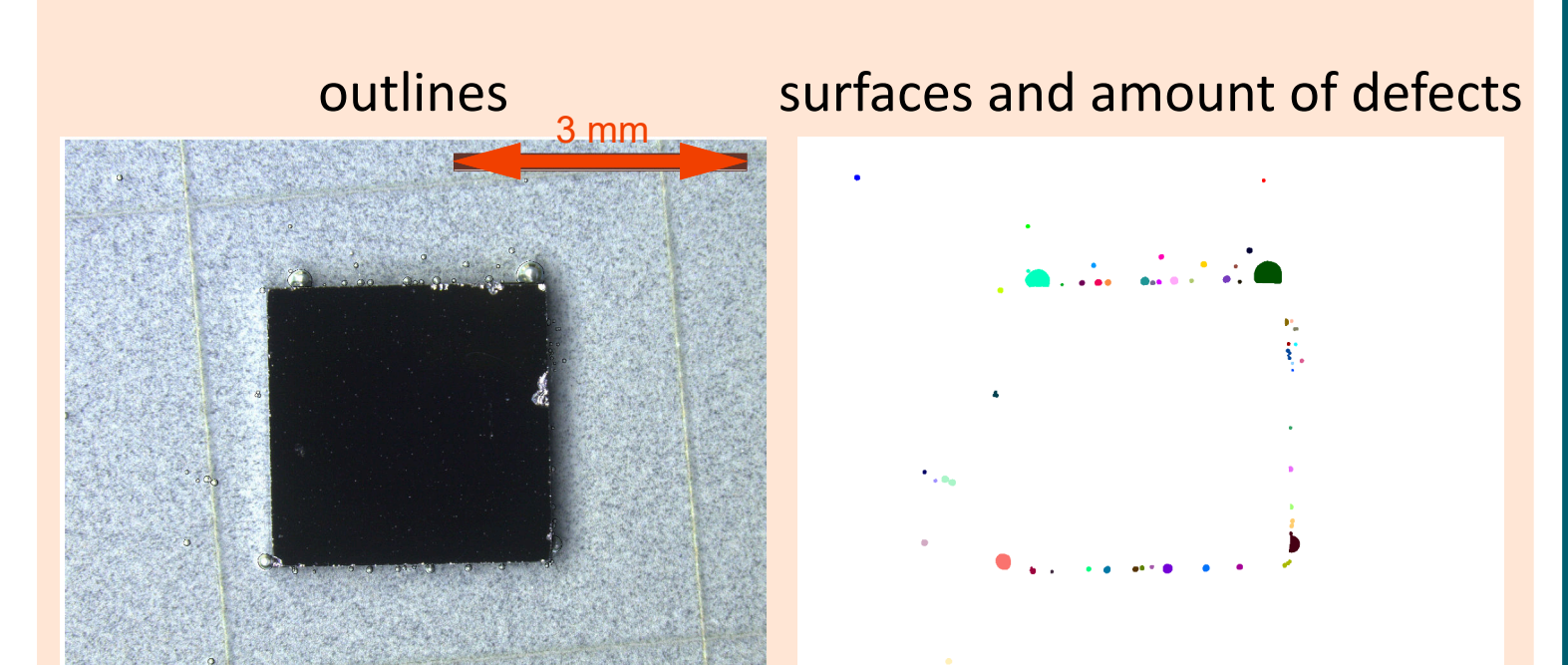
vacuum level: low (-0,6 bars)
high (-1bar)

drying conditions (temperature, vacuum, duration)

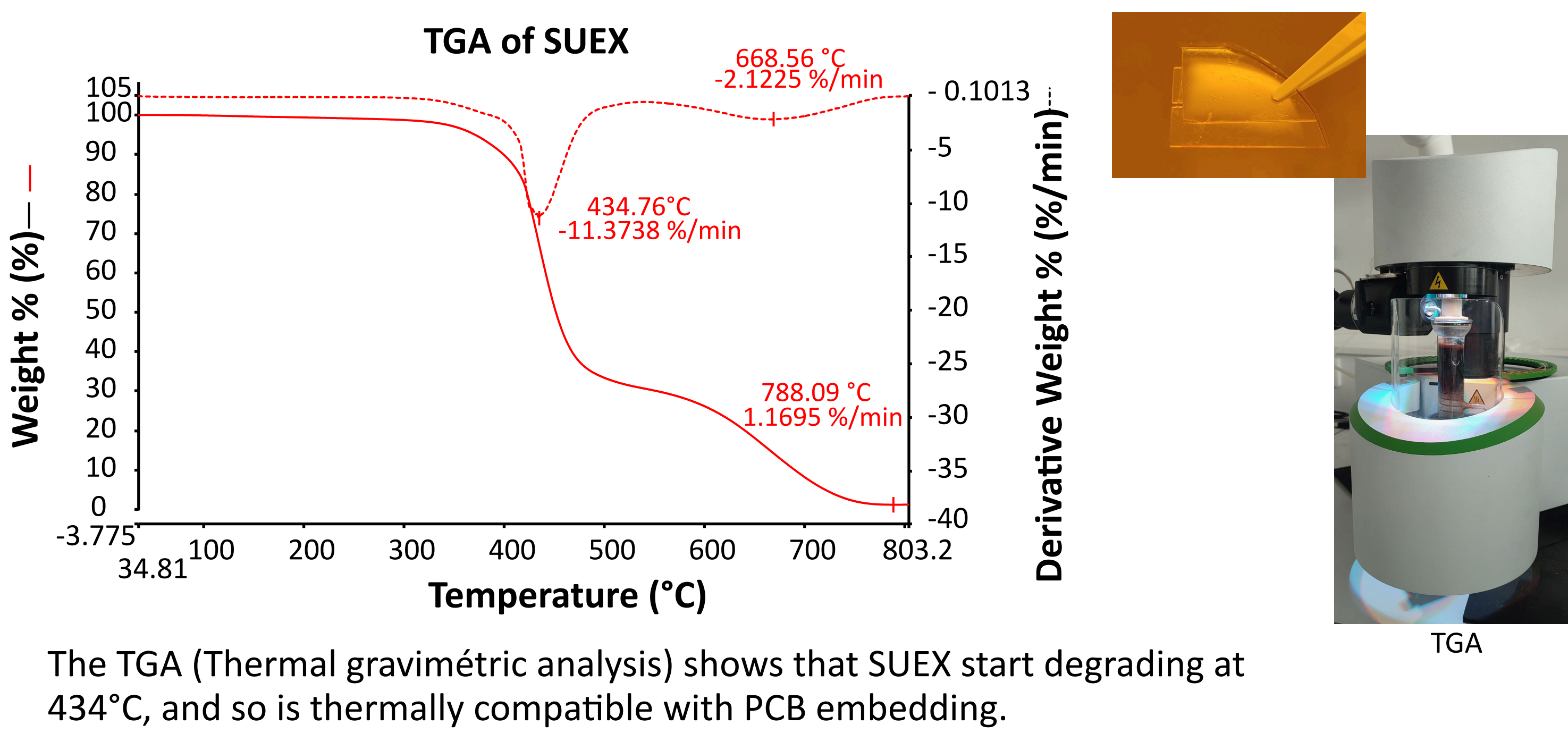
orientation (config A or B)

Parameters investigated

Caracterisation of obtained samples

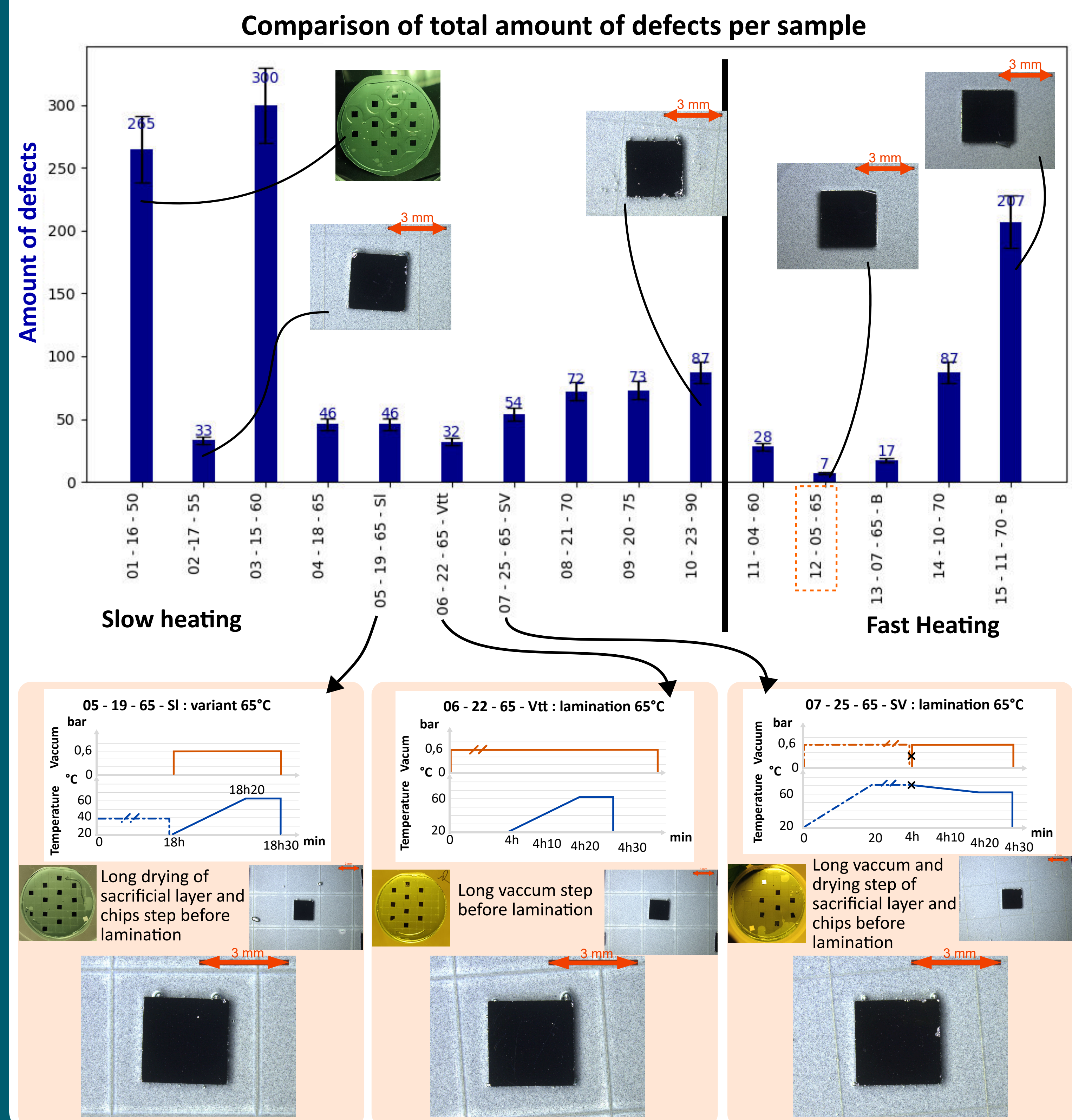


Material thermal characterization

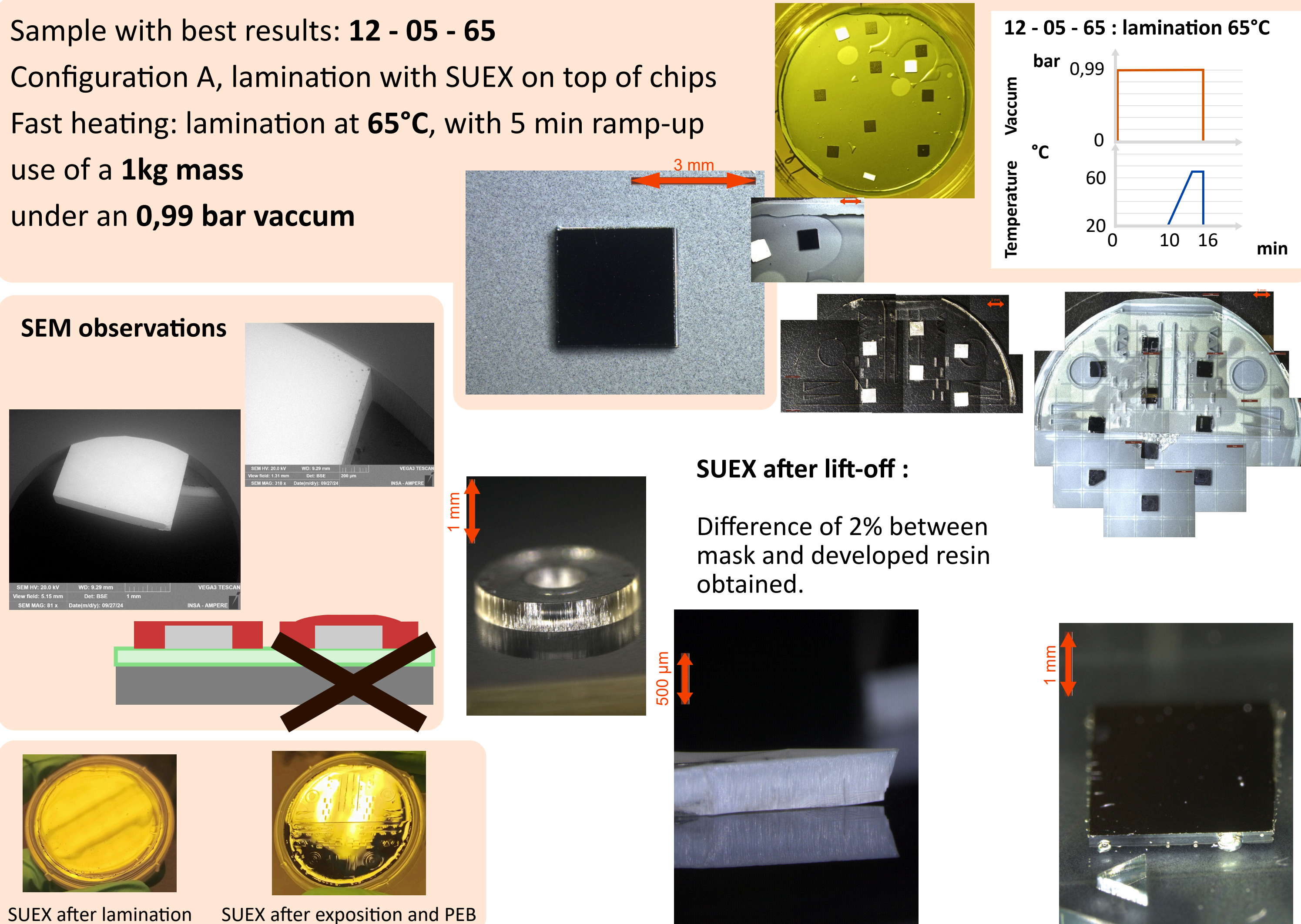


Lamination results

Comparison between several types of SUEX lamination: slow and fast heating cycles, with different lamination temperatures and an optionnal additional step



Photos gallery



Conclusion and perspectives

SUEX dry film resist was selected for thick chips encapsulation (400µm). TGA shows good materials stability. Good encapsulation requires the use of vacuum and fast-ramp-up to 65°C. A very short soak is needed, 1min. Very good form factor (2% difference) were achieved after photolithography. Mechanical and electrical testing must be performed to asses interface quality.

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