

MECHANICAL PROPERTIES OF GLASS-METAL ADHESIVE CONNECTION UNDER ELEVATED TEMPERATURE

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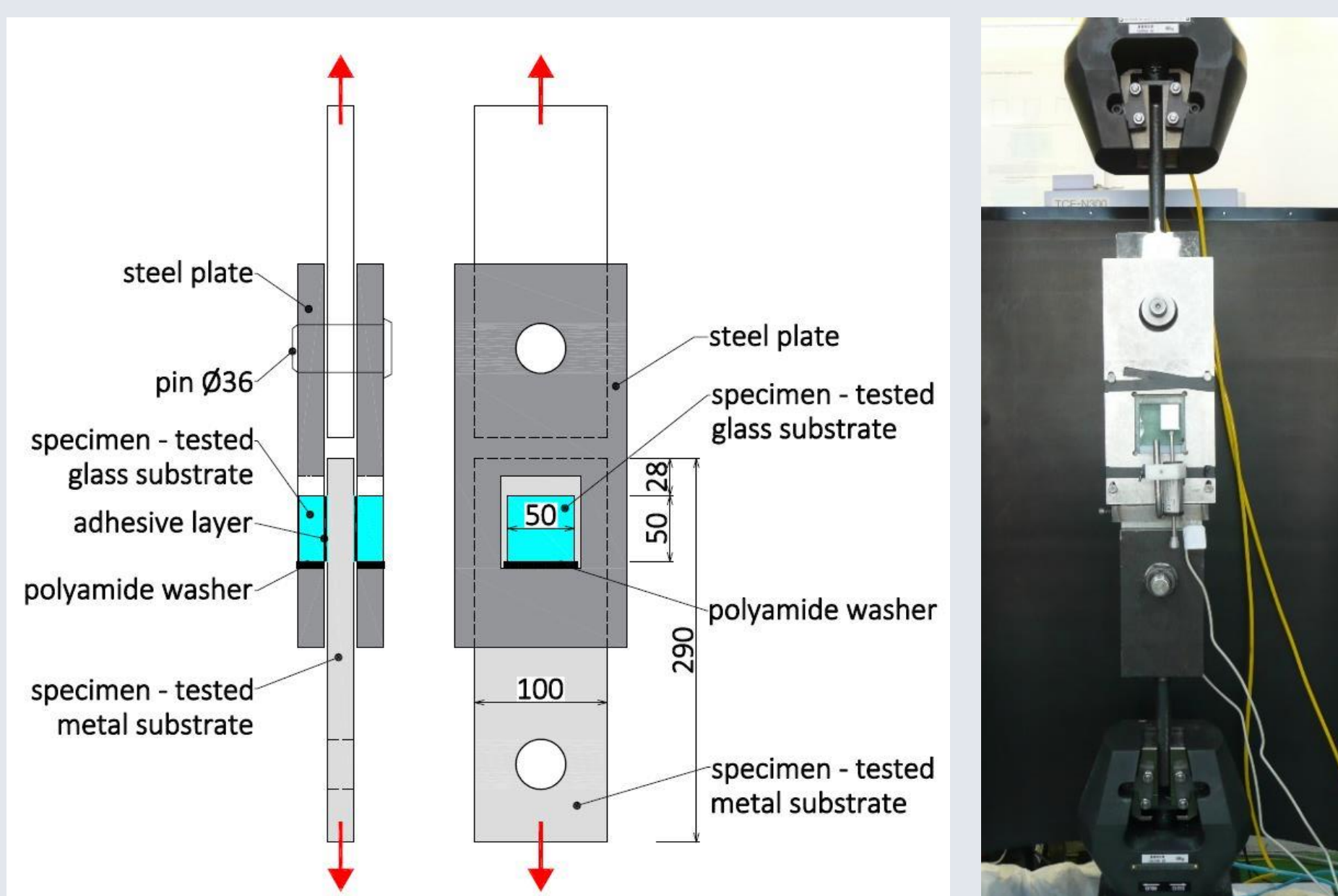


INTRODUCTION

- Adhesive bonding is commonly used in automotive and aerospace industry.
- Nowadays, adhesives are more used in civil engineering, especially for facade application as a modern type of connection.
- There is not enough knowledge about adhesives with higher strength and stiffness, especially about their behaviour at elevated temperature.

EXPERIMENTAL PROGRAMME

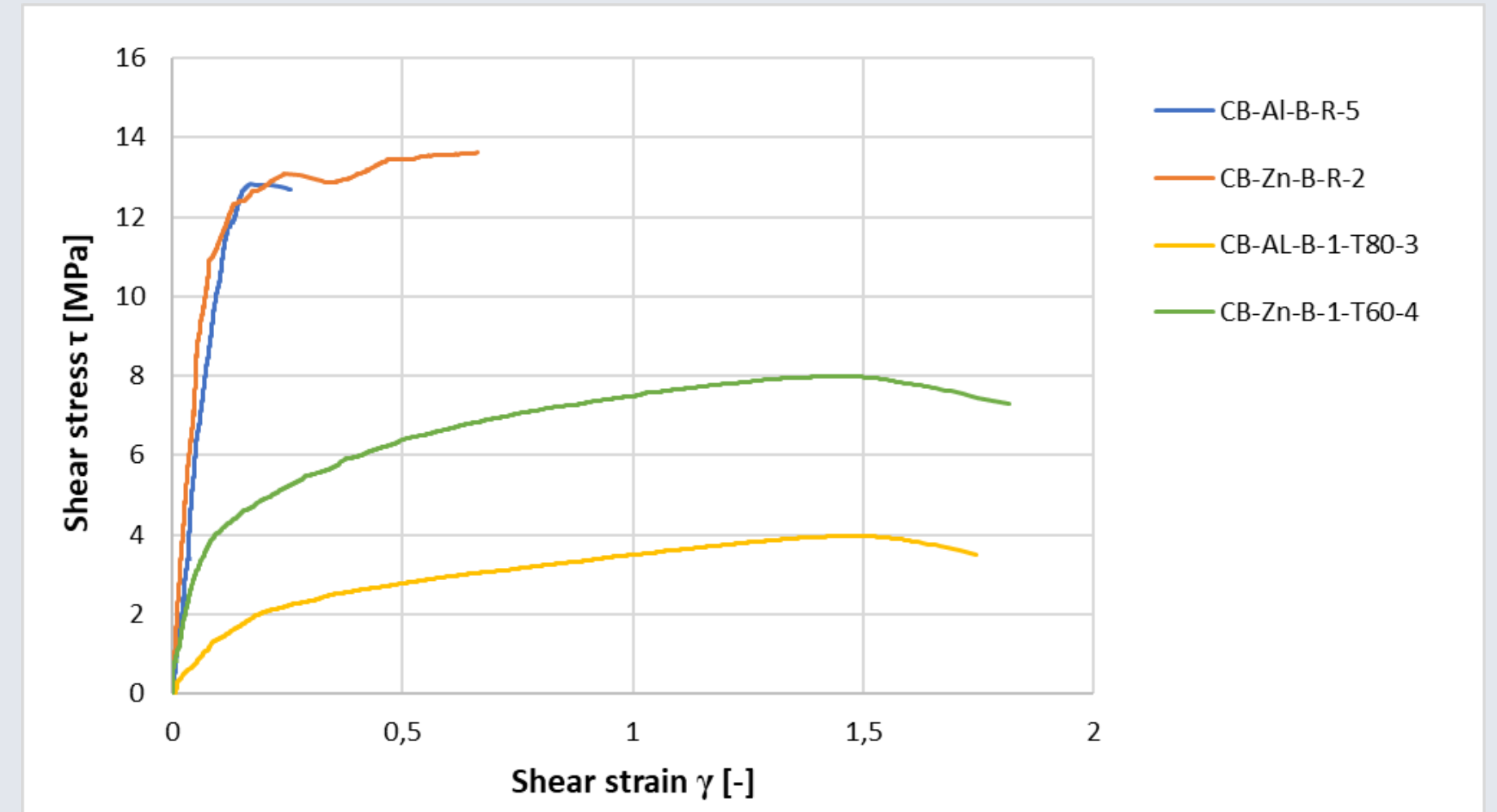
- Specimens as double lap shear joints.
- A float glass plate in the middle,
- Two different external metal sheets:
 - Zn-electroplated steel, roughened surface,
 - Aluminium, roughened surface.
- Two component acrylate was used as an adhesive bond.
- Joint thickness of 1 mm.



- Different temperatures during the test:
 - Room temperature,
 - Elevated temperature 60 °C,
 - Elevated temperature 80 °C.

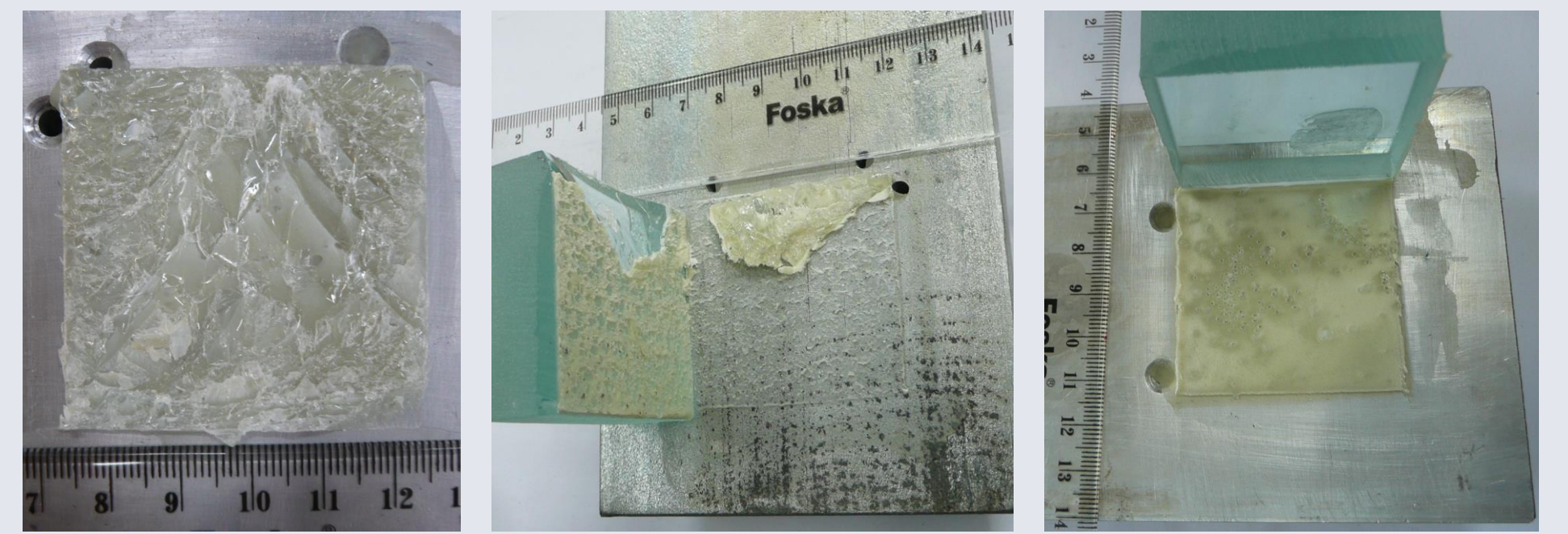
RESULTS

- Shear strength reduction on 63.7 % (60 °C) and 36.5 % (80 °C).
- Decrease of the initial stiffness and a bigger elongation with elevated temperature.

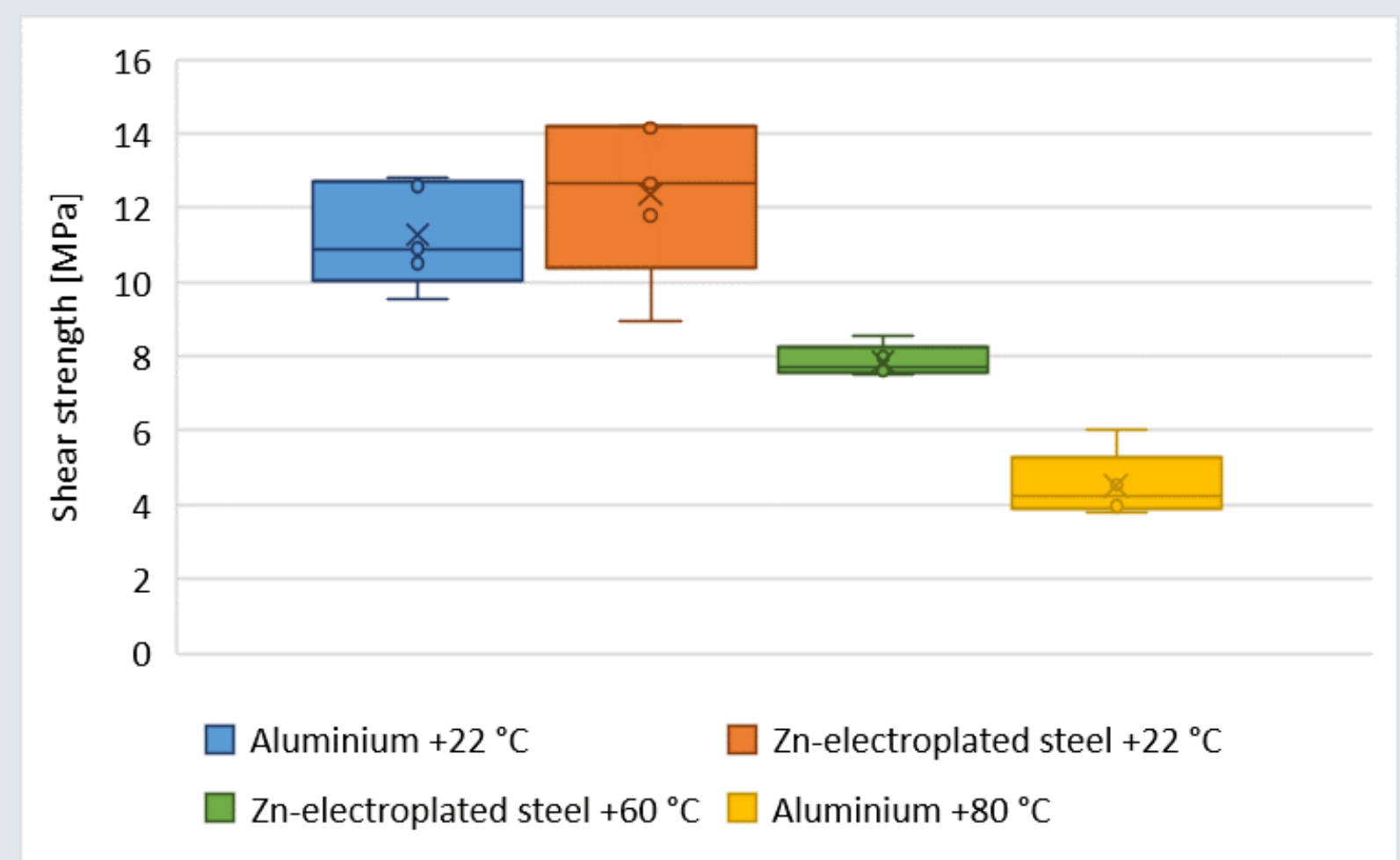


- Fracture of glass at the room temperature, at 60 °C combination failure mode with dominant cohesive mode of failure, at 80 °C failure of adhesion on the glass surface.

Temperature	Substrate	Average shear strength τ [MPa]	Standard deviation [MPa]	Failure mode	Ratio τ_i/τ_{ref}
22 °C	Zn-electroplated steel	12,356	1,407	A-C-S	100,0%
22 °C	Aluminium	11,267	2,152	S	91,2%
60 °C	Zn-electroplated steel	7,867	0,879	A-C-S	63,7%
80 °C	Aluminium	4,507	0,414	A	36,5%



Specimen at 22 °C (left), specimen at 60 °C (middle), specimen at 80 °C (right)



CONCLUSION

- Lower stiffness and strength with higher temperature.
- Low adhesion to glass for high temperature.

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