

TECHNISCHE UNIVERSITÄT  
CHEMNITZ

# CLUSTER OF EXCELLENCE MERGE

Merge Technologies for Multifunctional Lightweight Structures

## Process-oriented Interface Design for Hybrid Metal-Plastic Composites

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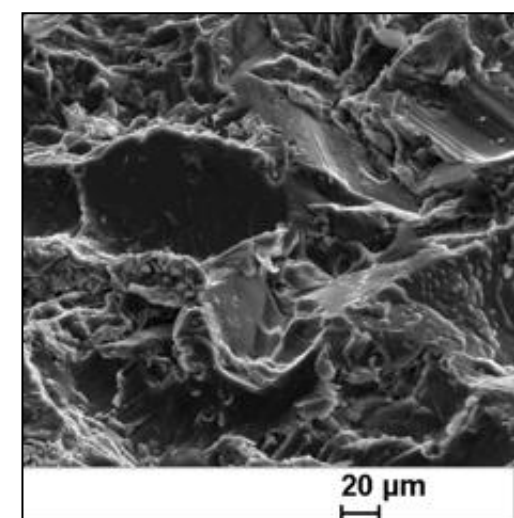
### MOTIVATION

The development of **hybrid composite structures** for lightweight construction requires the **intelligent combination of plastic and metal** in different composition with **defined interface design** between the joining partners. In the framework of the Federal Excellence Cluster MERGE a **novel adhesion promoter based on the twin polymerization** is developed for **improving the adhesion** between the plastic and metal component in metal-plastic composites. In addition, **different surface treatment** of the metal component are used to **evaluate the effect of the adhesion promoter** to **improve bond strength** of the composites. The adhesion should be carried out in view of **the energy and resource efficiency** alone possible **through the use of existing process heat in the tool** (injection molding, pressing).

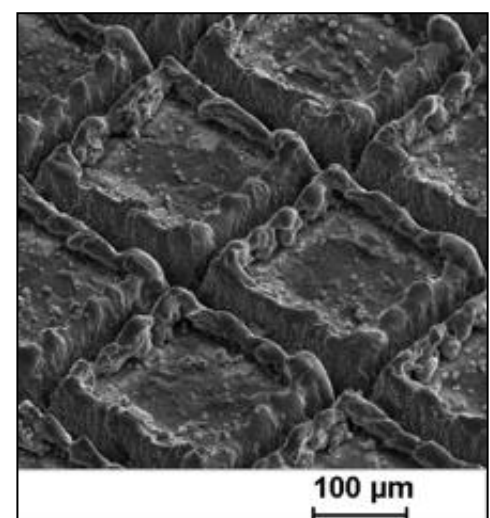
### MAIN RESEARCH

#### surface structuring

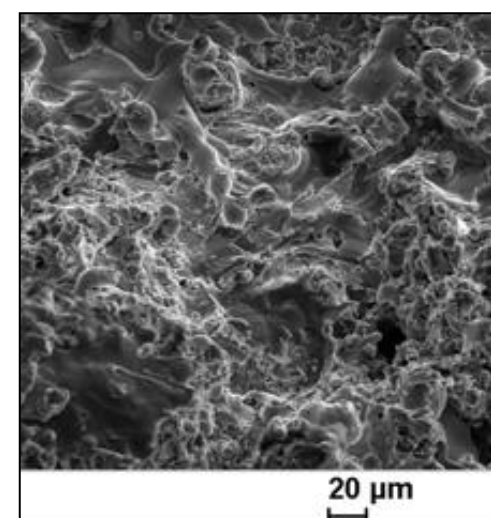
Thermal  
spraying



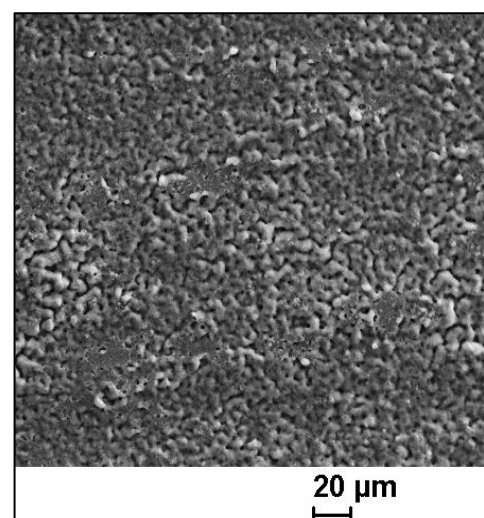
Laser  
structuring



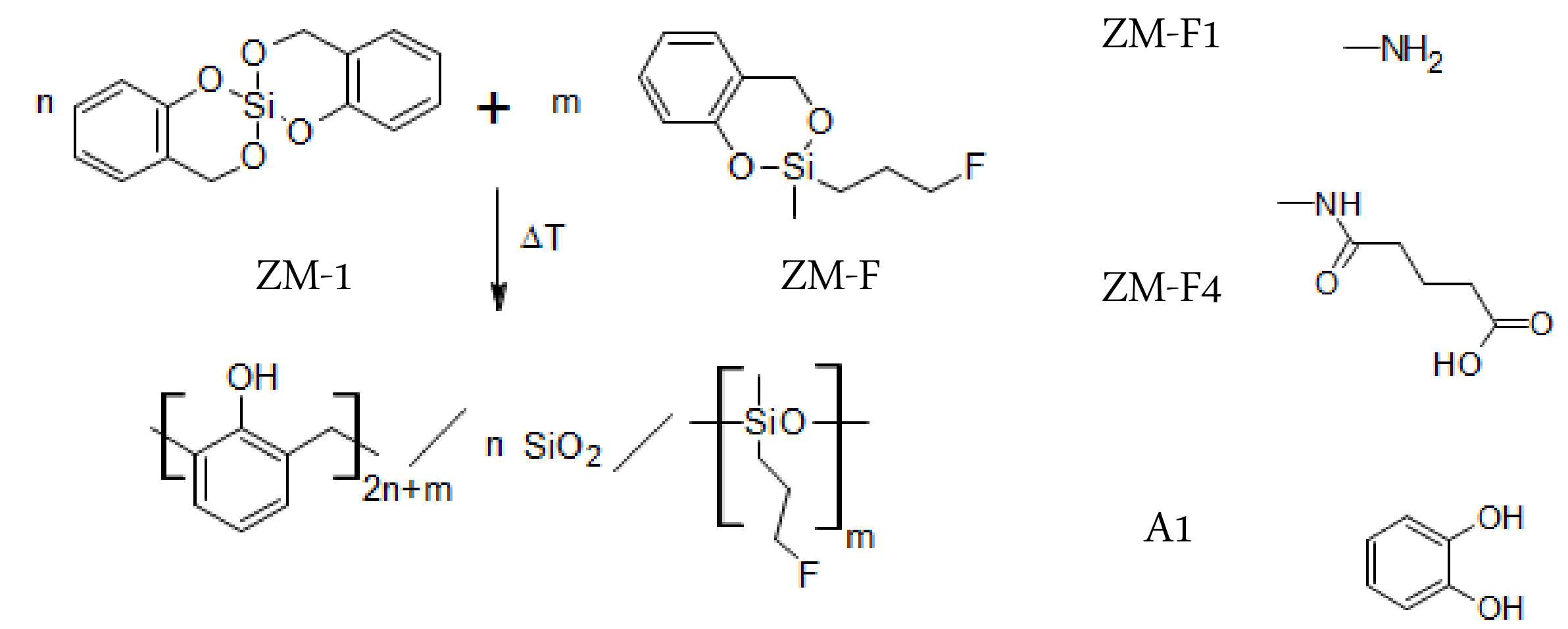
Grit  
blasting



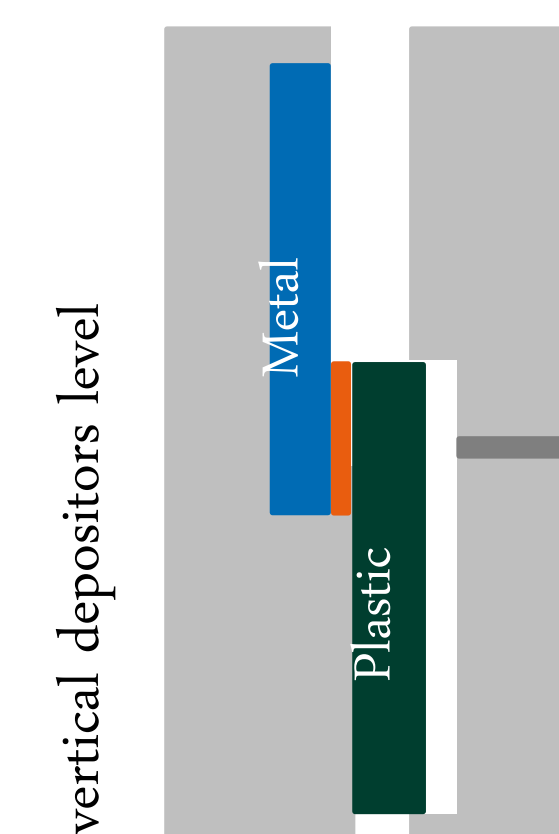
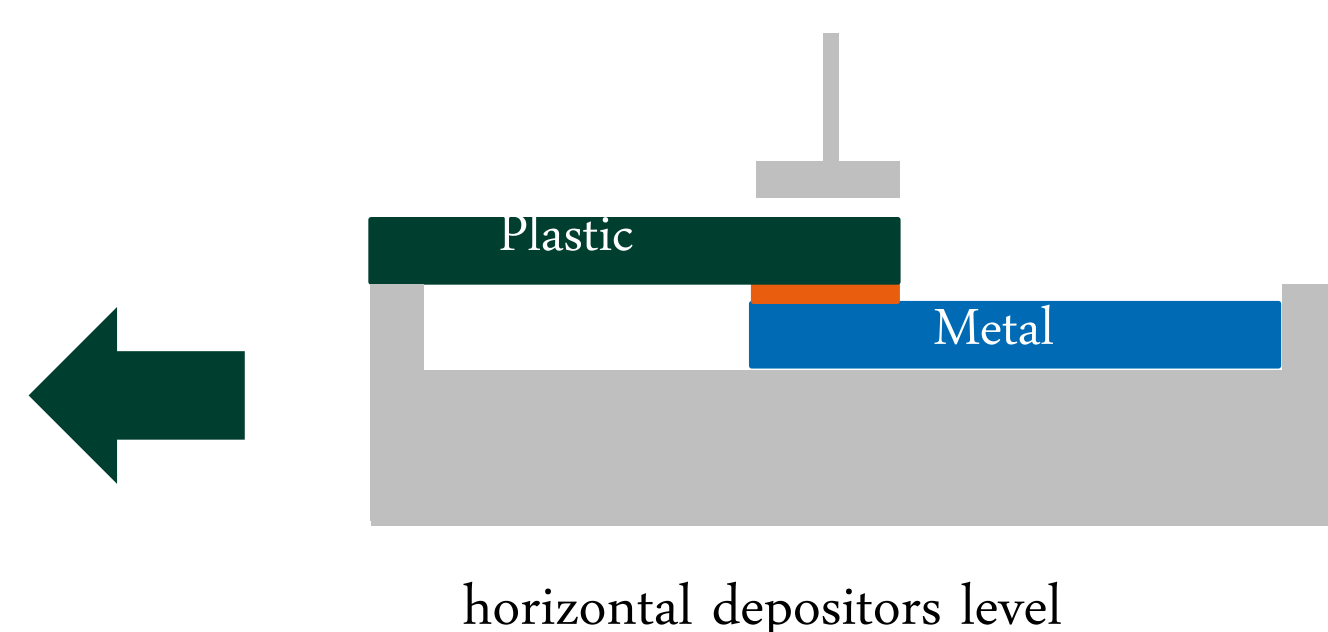
Plasma  
electrolytic  
oxidation



#### use of adhesion promoter

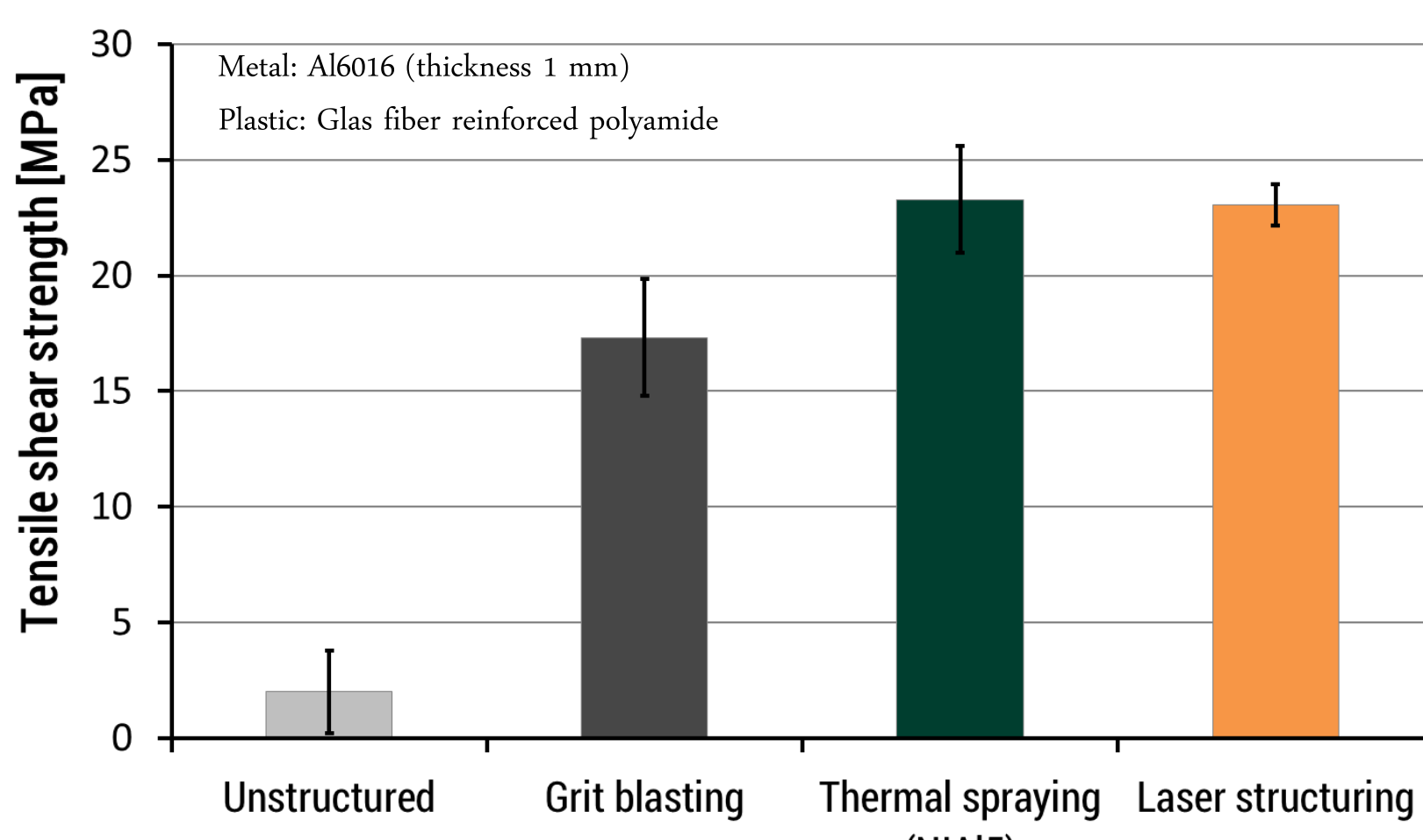


- Use low- to high-viscosity adhesion promoter;
- variable temperature control

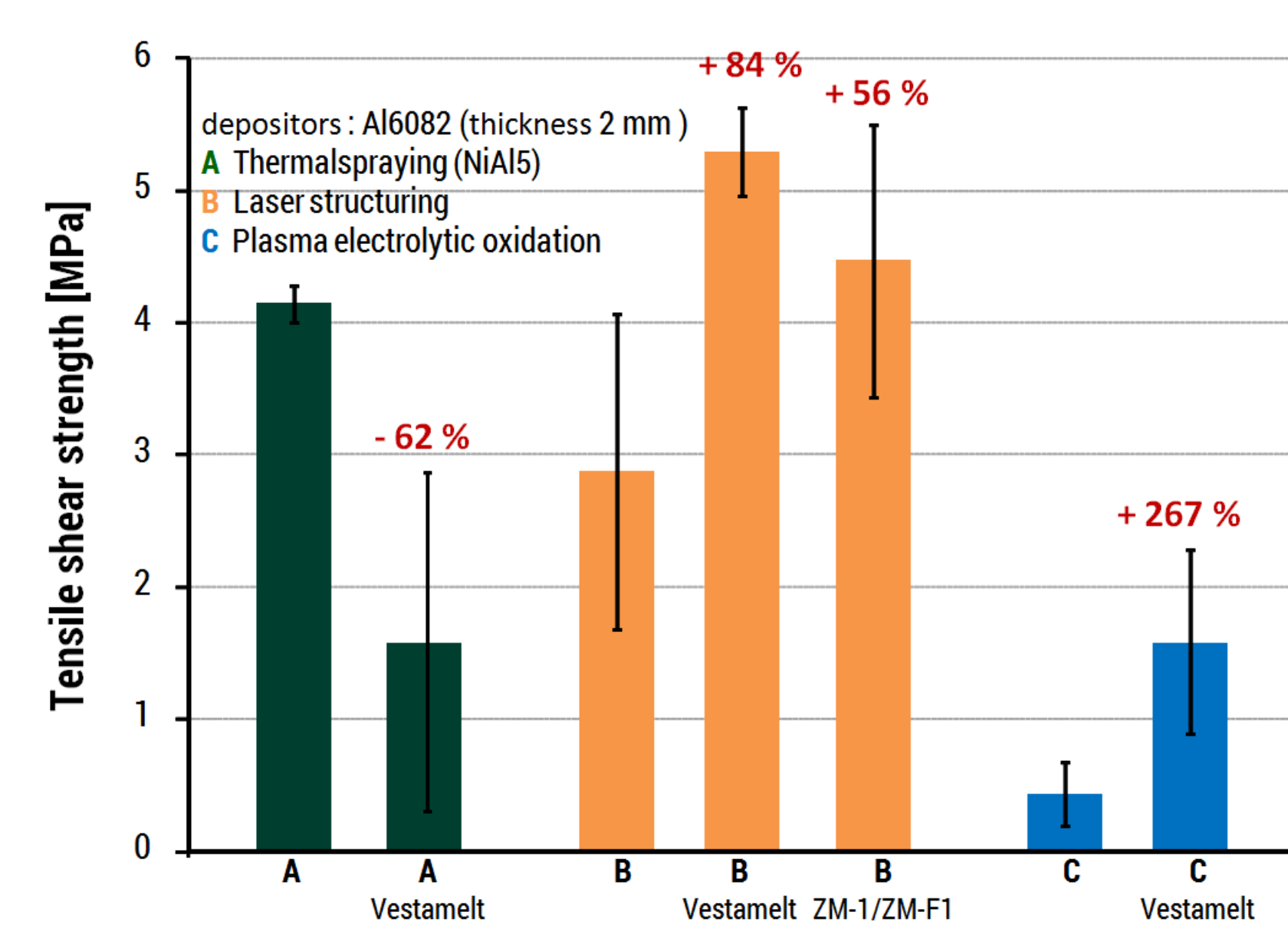
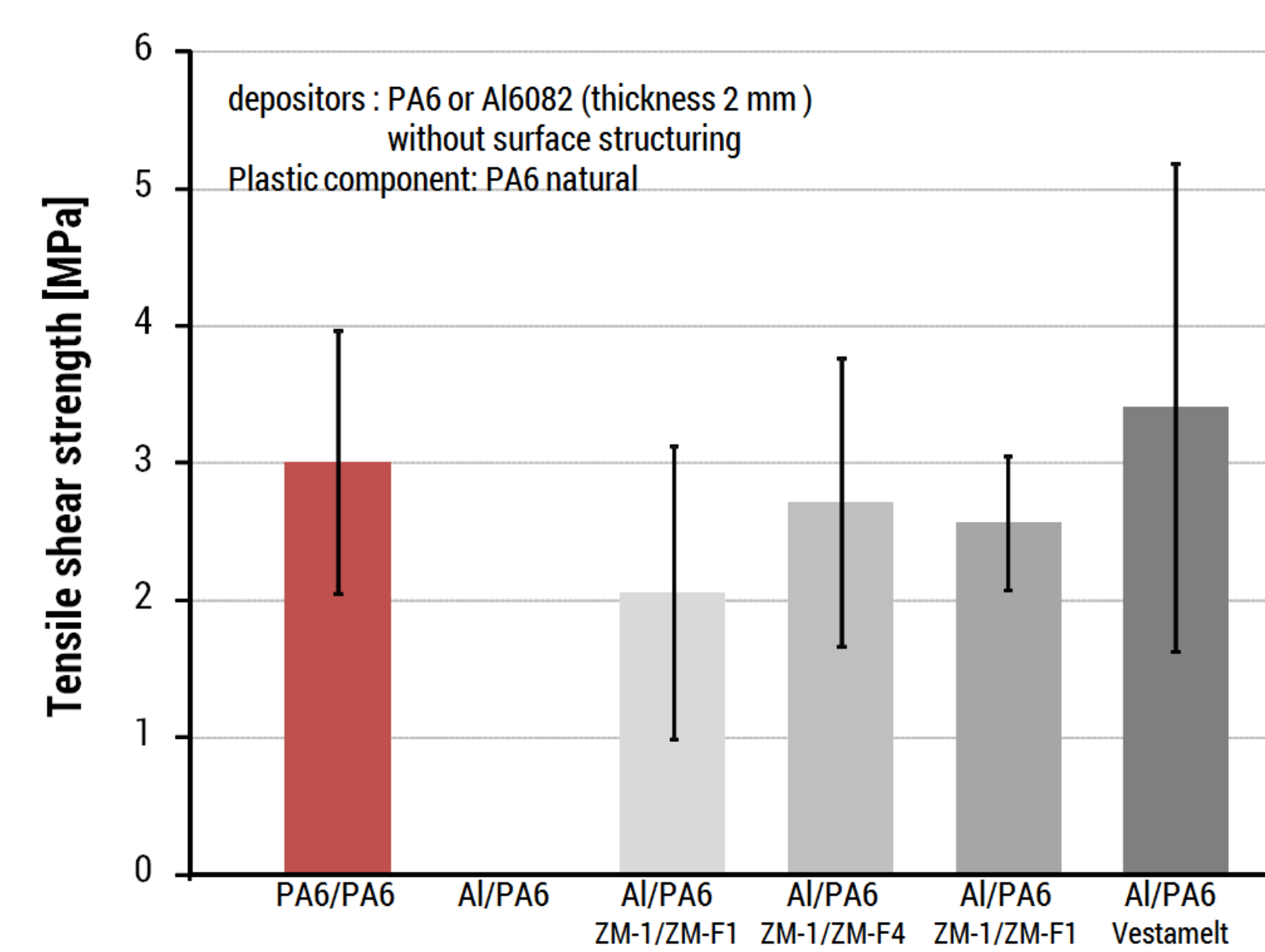
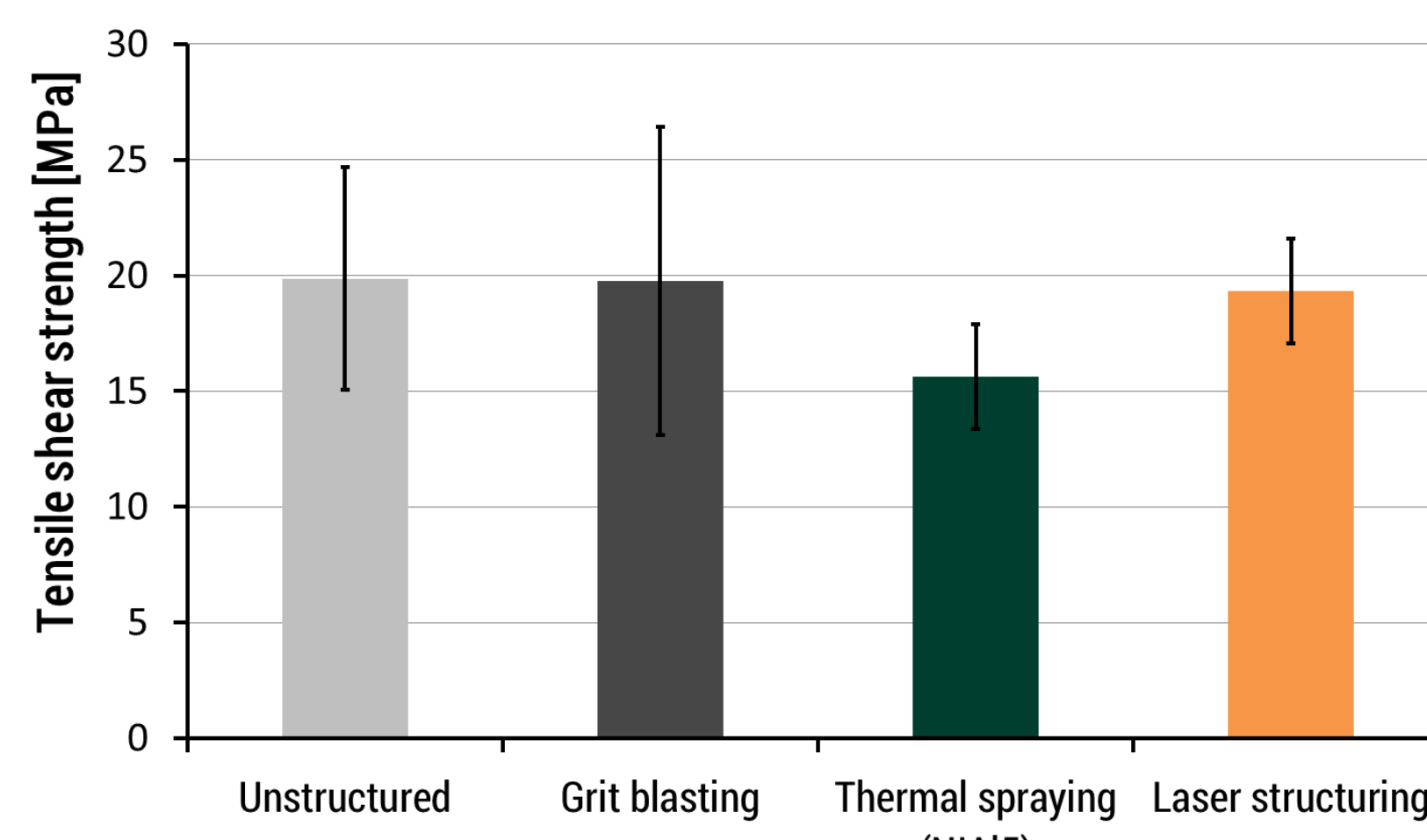


- High viscosity required;
  - only conditionally variable temperature control possible
- ⇒ High demands on the bonding agent system

#### without bonding agent



#### with bonding agent



Significant increase in the tensile shear strength by laser structuring, plasma electrolytic oxidation and use of adhesion promoters

The highest strength is achieved by surface structuring of metallic component using thermal spraying (NiAl5) or laser structuring.

A multiple increase in tensile shear strength of about ten due to bonding agent is possible by using an unstructured surface of the metal part.

RESULTS

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