

RAPID MATERIAL DEVELOPMENT AND PROCESSING OF COMPLEX SHAPED PARTS VIA TUNGSTEN POWDER INJECTION MOLDING

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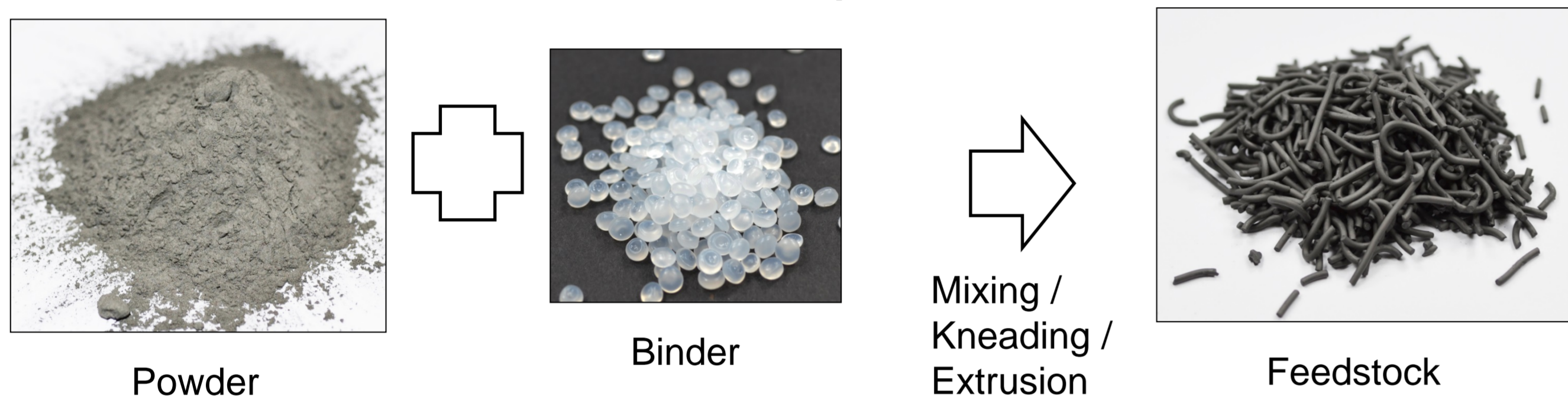
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Motivation:

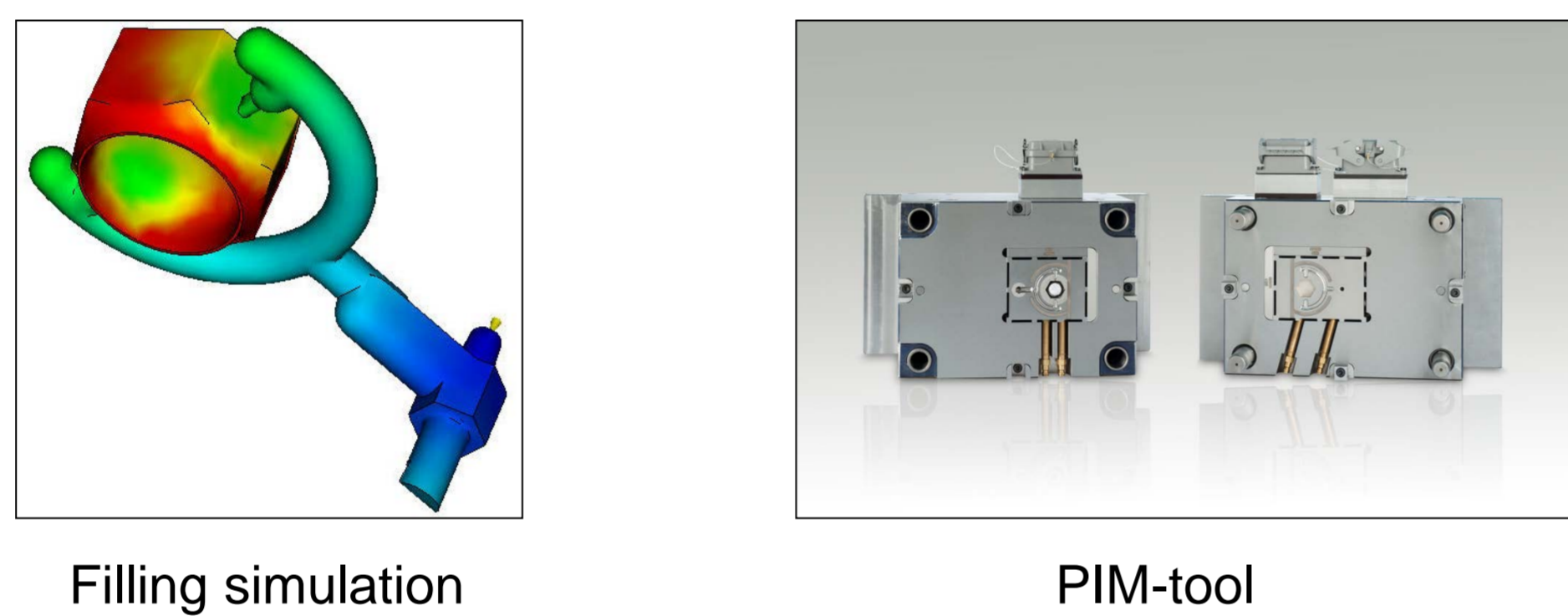
The manufacturing of tungsten parts by mechanical machining, such as milling and turning, is extremely cost and time intensive. Powder Injection Molding (PIM) is a promising manufacturing method in view of large-scale production of parts with high near-net-shape precision, hence, offering the advantage of a cost-saving process compared to conventional machining.

POWDER INJECTION MOLDING (PIM)

Material development



Design + Engineering of a tool



Injection Molding
Debinding
Heat-treatment

MANUFACTURING TECHNOLOGY

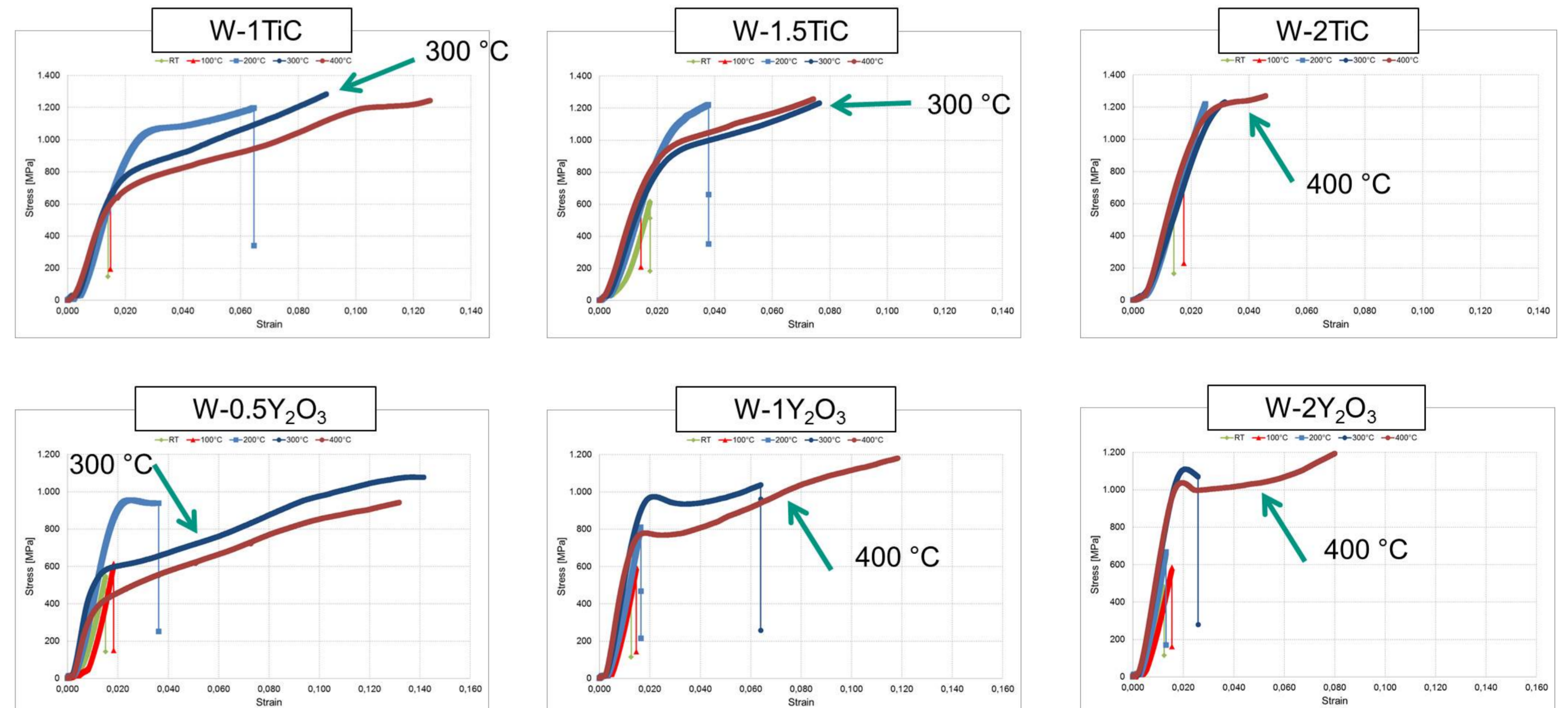
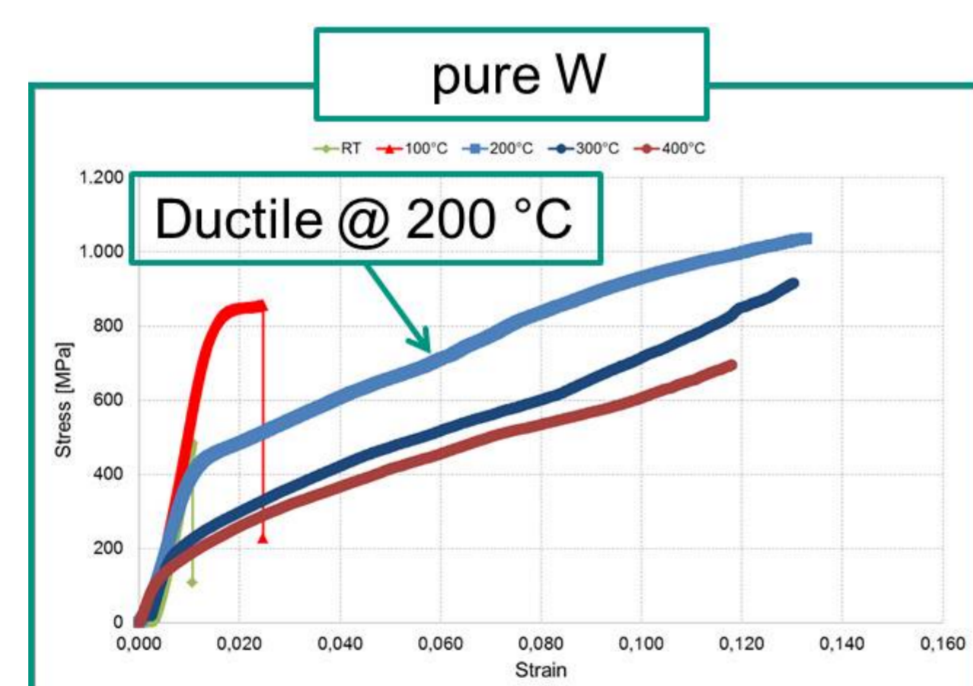
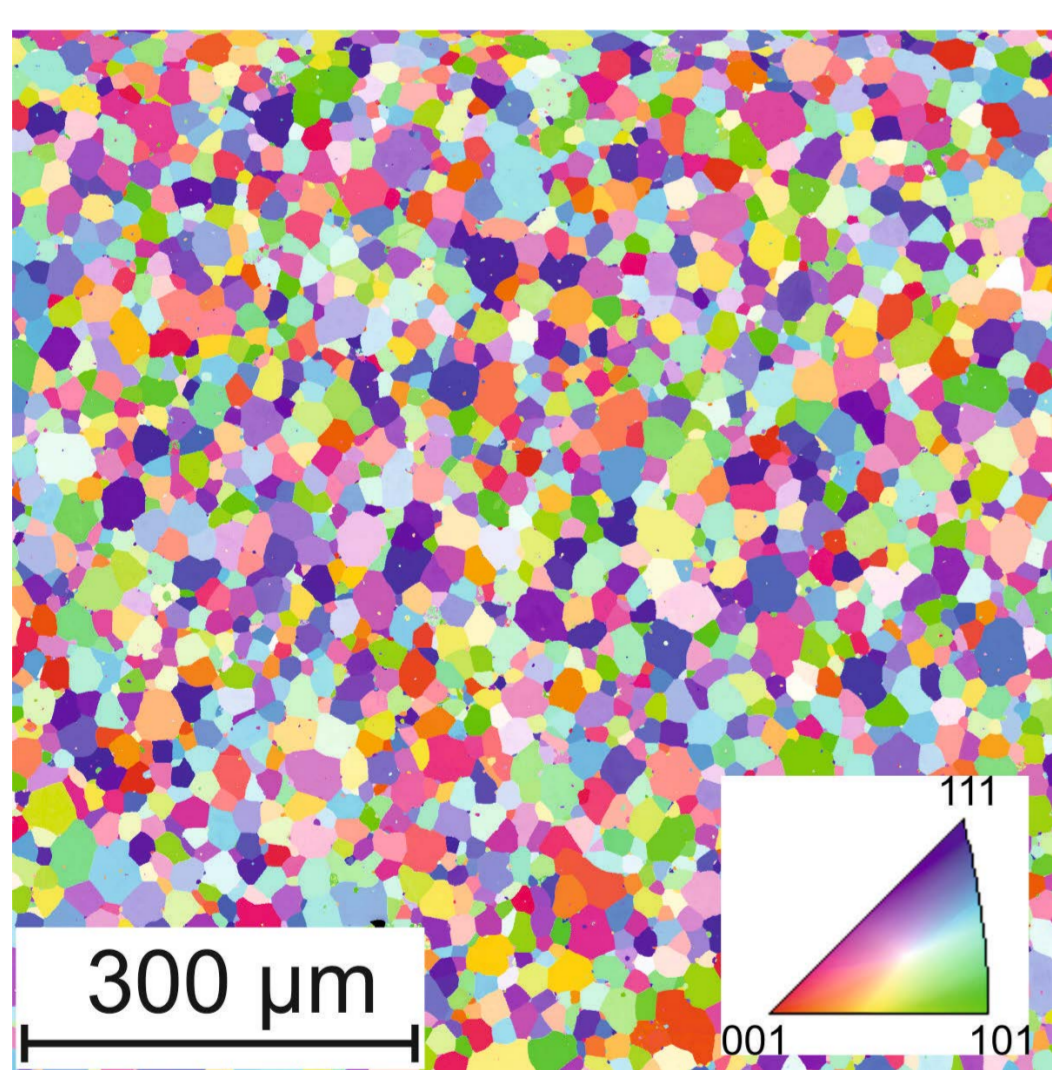


MASS PRODUCTION OF COMPONENTS

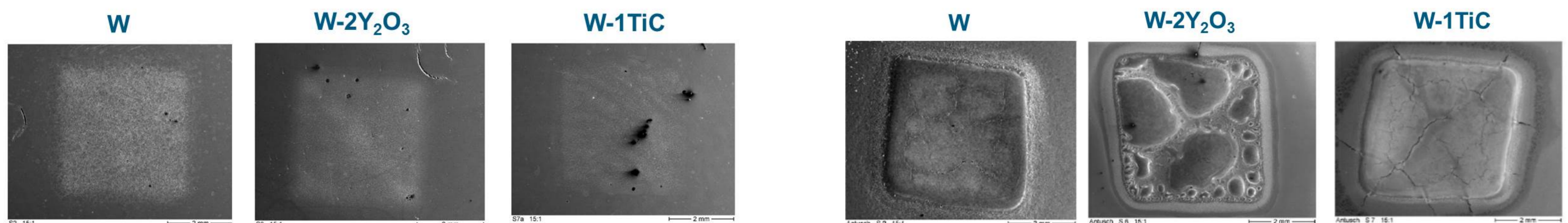
RAPID MATERIAL DEVELOPMENT

4-Point-Bending Tests

Sample geometry: (12 x 1 x 1) mm
Constant strain rate: 0.0330 mm/min



Thermal shock testing with e-beam in JUDITH-1



T [°C]	P _{abs} [GW/m ²]	Δt [ms]	E _{abs} [MJ/m ²]	F _{HF} [MW/m ² s ^{1/2}]	# shots
1000	0.38	1	0.38	12	1000

T [°C]	P _{abs} [GW/m ²]	Δt [ms]	E _{abs} [MJ/m ²]	F _{HF} [MW/m ² s ^{1/2}]	# shots
1000	1.13	5	5.67	80	100

Conclusions:

PIM as special process allows the mass production of components, the joining of different materials without brazing, the creation of composite and prototype materials, and is an ideal tool for scientific investigations.

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