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MECHANICAL AND MICROSTRUCTURAL PROPERTIES OF VARIOUS SINTERED W-PIM MATERIALS

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Motivation:

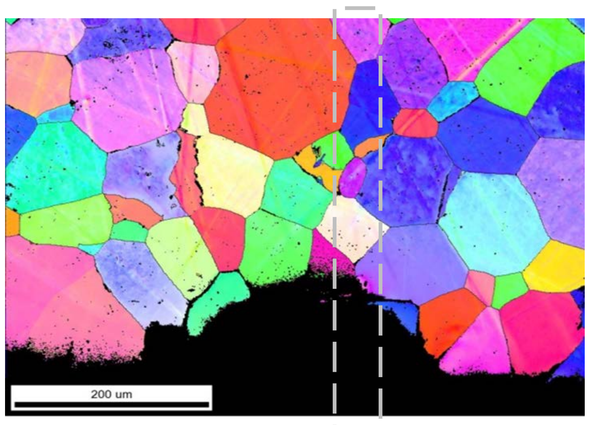
The manufacturing of tungsten parts by mechanical machining, such as milling and turning, is extremely cost and time intensive. Powder Injection Molding (PIM) is a promising manufacturing method in view of large-scale production of parts with high near-net-shape precision, hence, offering the advantage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

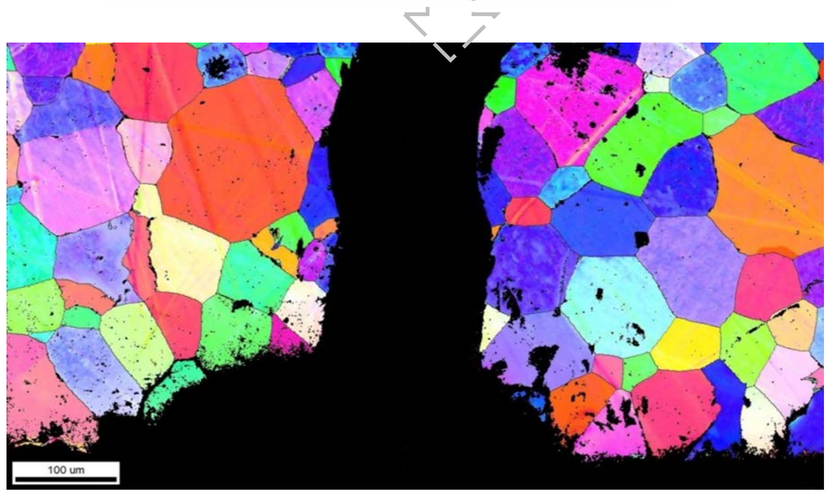
RAPID MATERIAL DEVELOPMENT

4-Point-Bending Tests

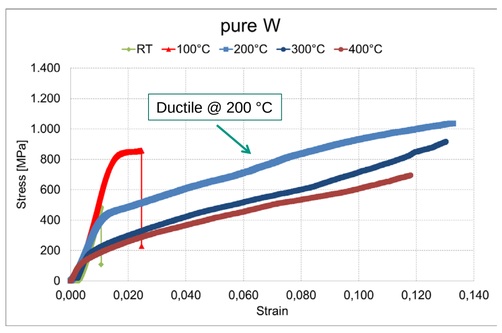
Sample geometry: (12 x 1 x 1) mm
Constant strain rate: 0.0330 mm/min

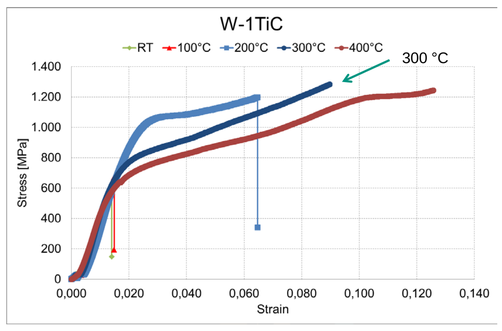
EBSD of the notch

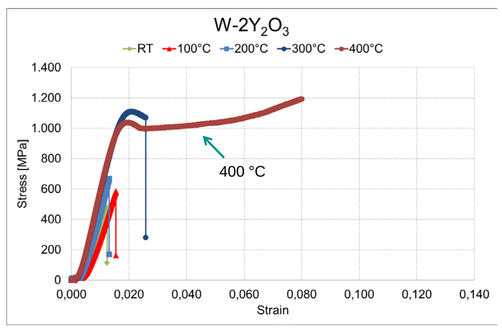




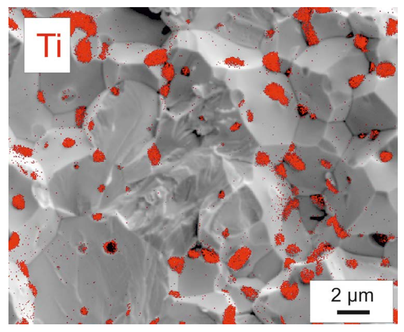
Pure W @ RT: transgranular crack

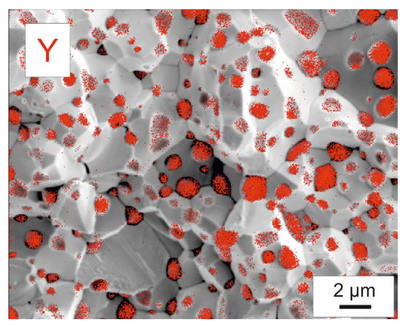


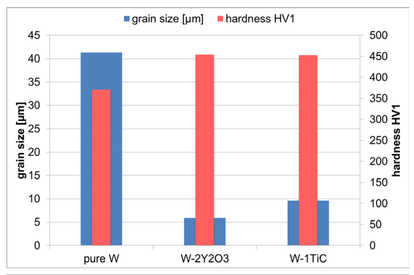


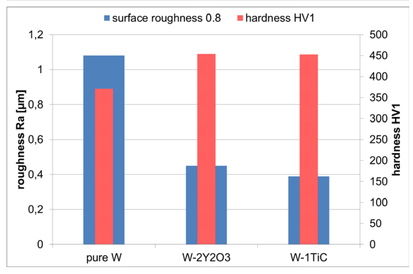


AES: Microstructure & element allocation

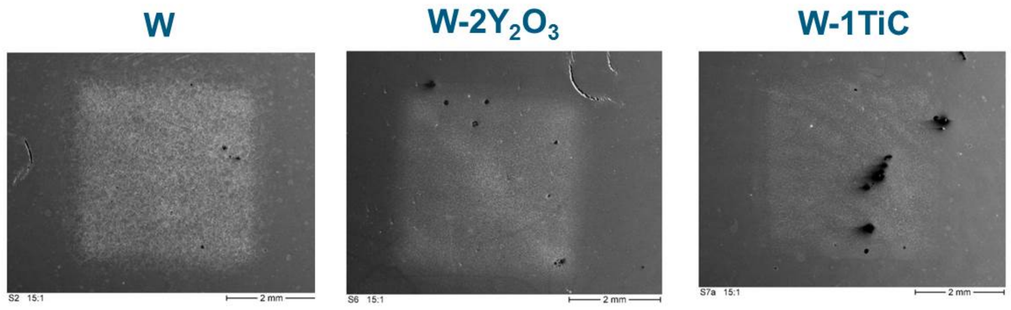






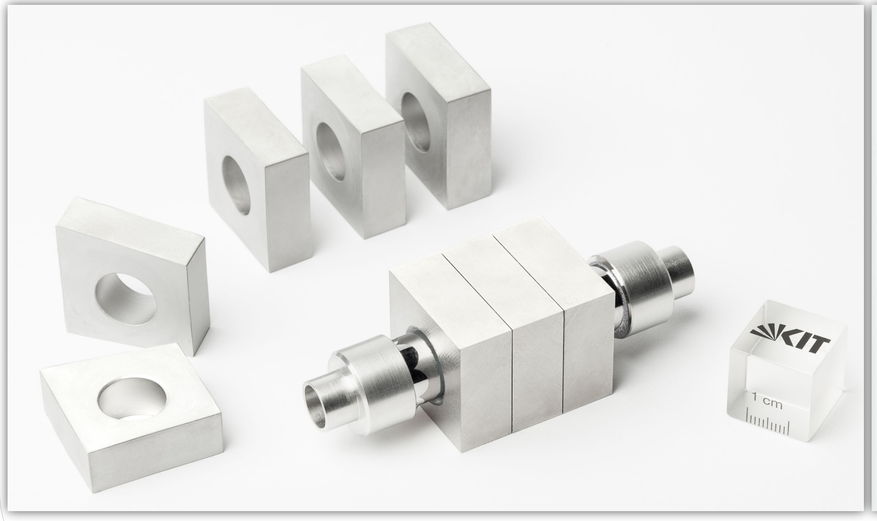


Thermal shock testing with e-beam in JUDITH-1



T [°C]	P_{abs} [GW/m²]	Δt [ms]	E_{abs} [MJ/m²]	F_{HF} [MW/m²*s$^{1/2}$]	# shots
1000	0.38	1	0.38	12	1000

MASS PRODUCTION OF COMPONENTS



Monoblocks with various shapes

Samples for ASDEX Upgrade

Langmuir probes for WEST

Conclusions:

PIM as special process allows the mass production of components, creation of composite and prototype materials, and is an ideal tool for scientific investigations.

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