

2Component-Powder Injection Molding (2C-PIM)

Activity 4: Material Technologies

WP12-MAT-01-HHFM-04-04/KIT/PS

Reporting period: June 2012 – February 2012

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KIT-IAM

Contributions:

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Objective

→ **Investigation** of multi-phase **PIM** to extend the fabrication process for more complex functional high heat flux **parts**

(1) Implementing of the new 2Component-PIM (2C-PIM) tool

(2) Producing of 2C-PIM parts:

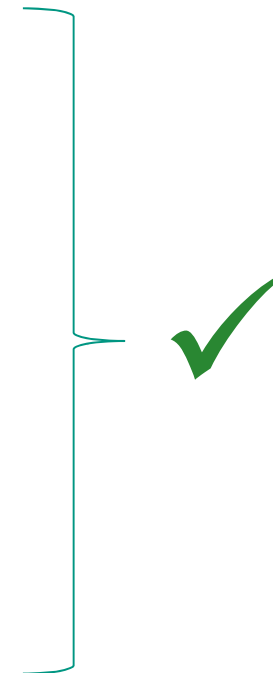
⇒ W tile + W-2La₂O₃ timble

⇒ W tile + W-2Y₂O₃ thimble

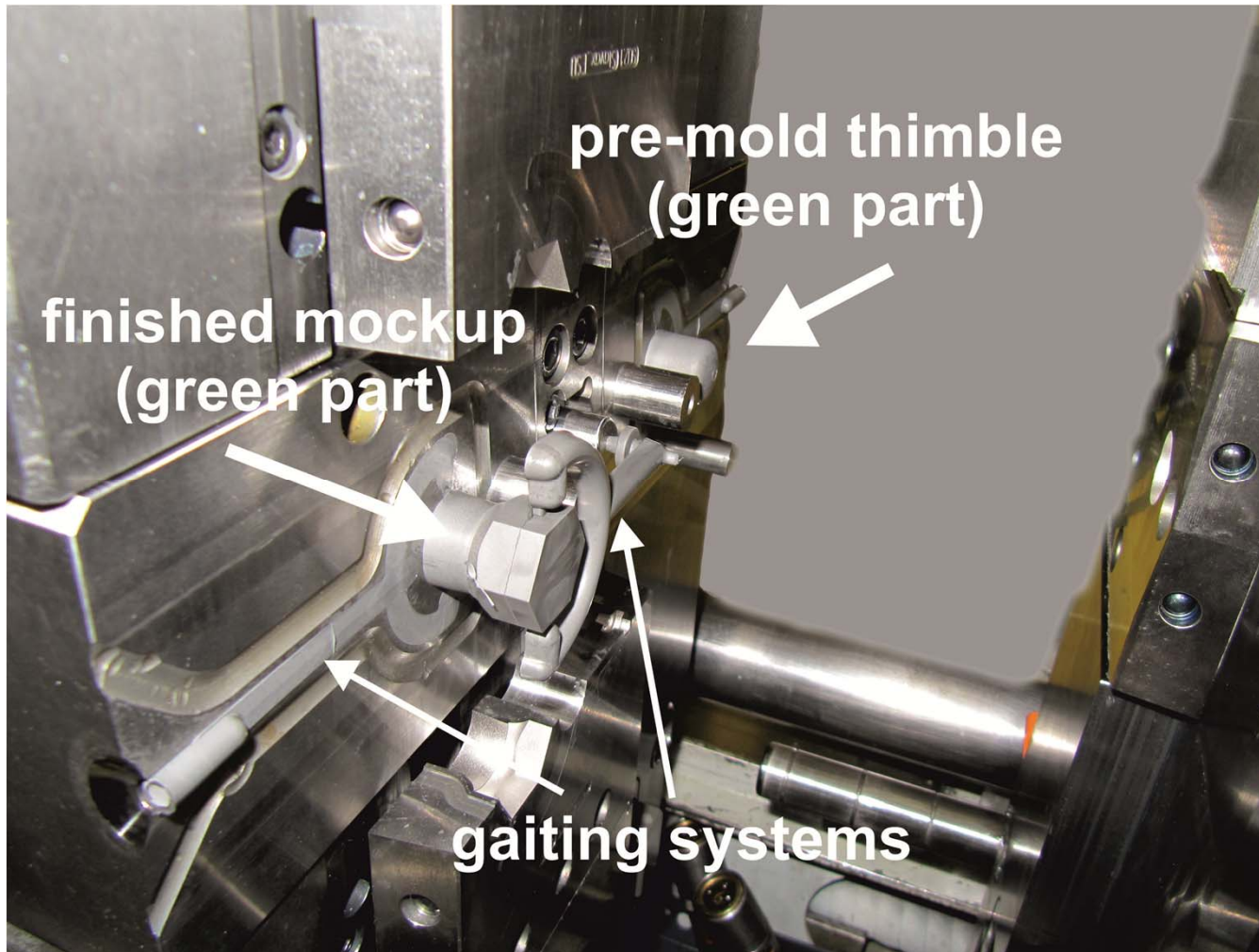
(3) Modulate of the Heat-treatment process

(4) Characterization of the joining zone quality

(5) Integration of interlayer within 2C-PIM



(1) Implementing of the new 2C-PIM tool



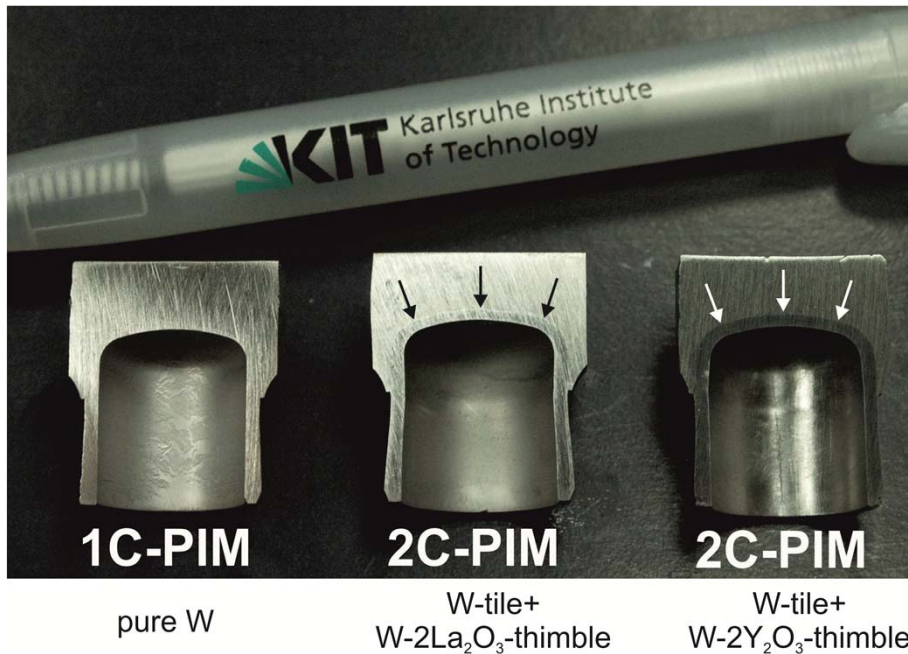
(2) Producing of 2C-PIM parts

Fully automatic mass production of parts:
50 SECONDS for 1 Mockup



S. Antusch et al., Fusion Engineering and Design (2012) submitted.

(4) Characterization

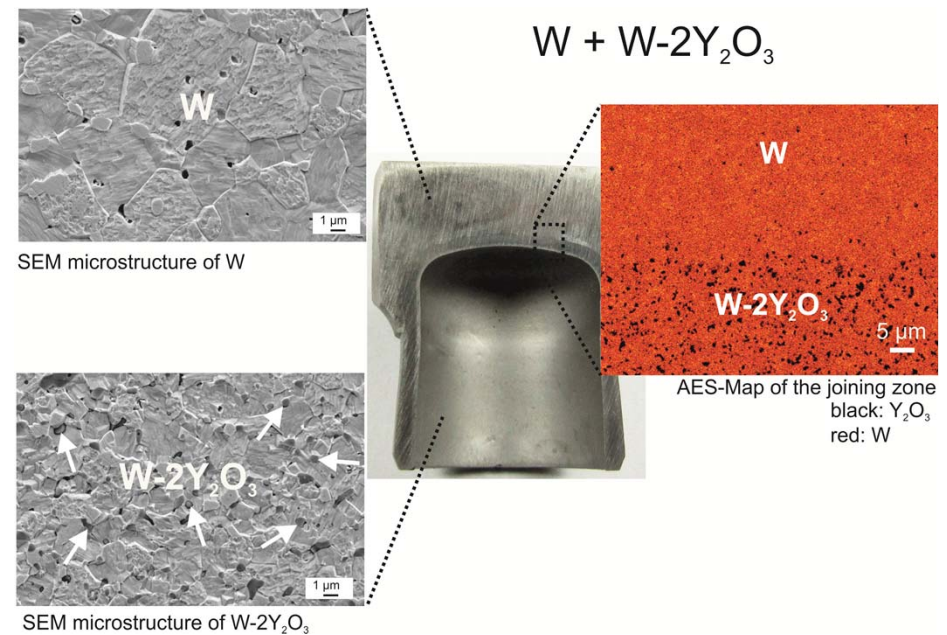


Joining without brazing

High quality of the joint

Material connection are successful

No gaps or cracks in the seam of the joining zone



S. Antusch et al., Journal of Nuclear Materials (2012) submitted.

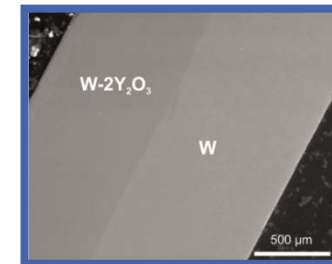
Conclusions

Powder Injection Molding = tool

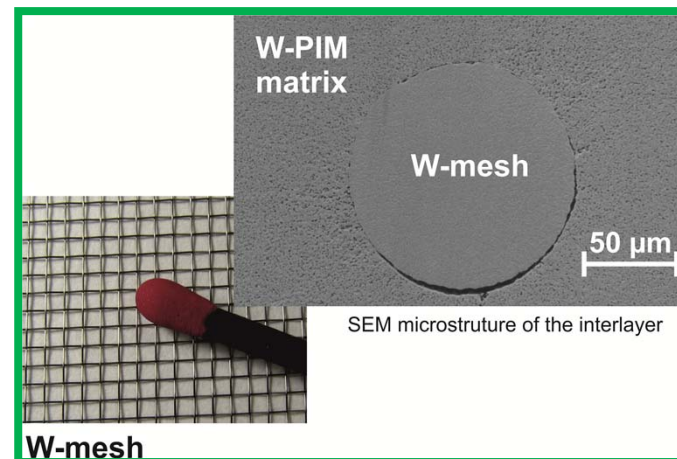
→ Near-net-shape forming process for parts and components



→ Joining technique



→ Material development



Outlook Work Programme for 2013



Goal 2013: Development of a multiphase PIM tool

- (1) Development of new Designs for HC + WC Divertor (in close Cooperation with CCFE)
- (2) Engineering and design of a new multiphase PIM tool
- (3) Production of parts with the new tool
- (4) Adaption of the heat-treatment process (in close cooperation with PLANSEE SE)
- (5) Characterization of mechanical and physical properties (in close cooperation with OXFORD Materials)
- (6) HHF testing (in close cooperation with FZ Jülich and IPP Garching) and characterization after testing

Thank you very much!