

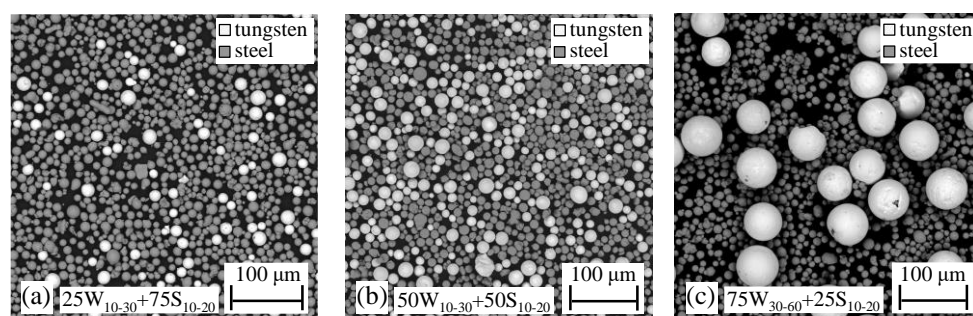
# Processing and Properties of Sintered W/Steel Composites for the First Wall of Future Fusion Reactor

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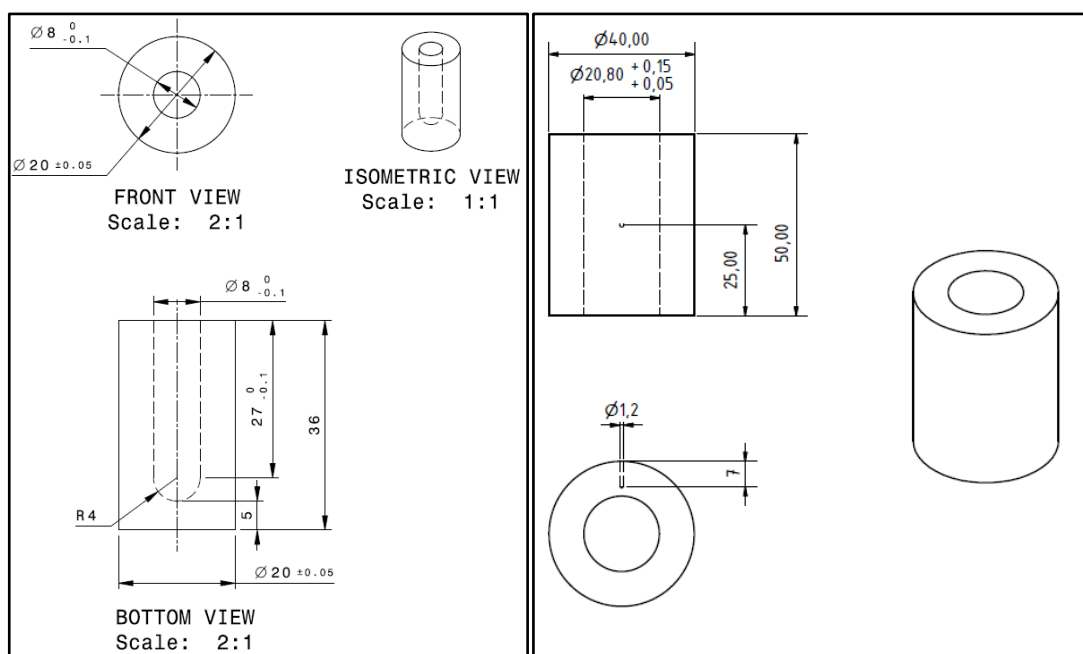
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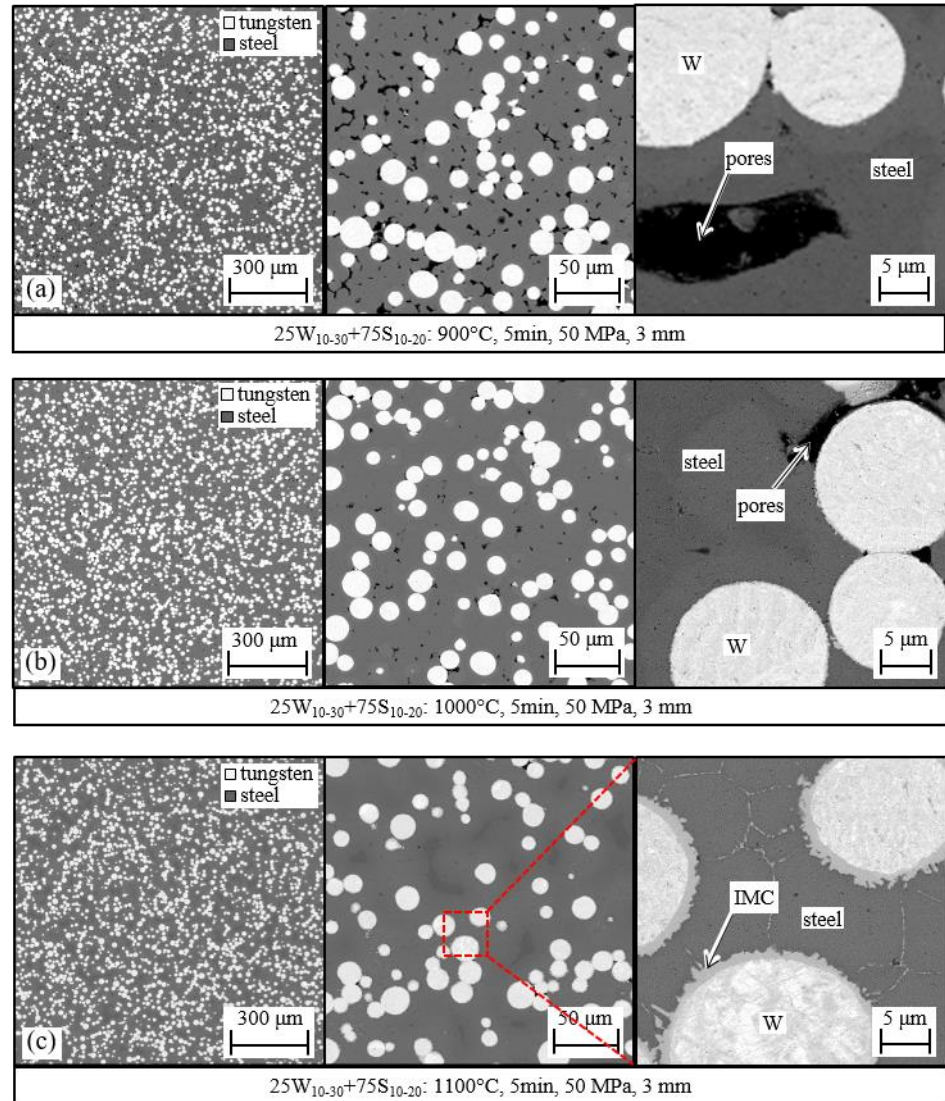


**Figure S1.** SEM images of some of the mixed W-steel powders: (a) 25W<sub>10-30</sub>+75S<sub>10-20</sub>; (b) 50W<sub>10-30</sub>+50S<sub>10-20</sub>; and (c) 75W<sub>30-60</sub>+25S<sub>10-20</sub>.

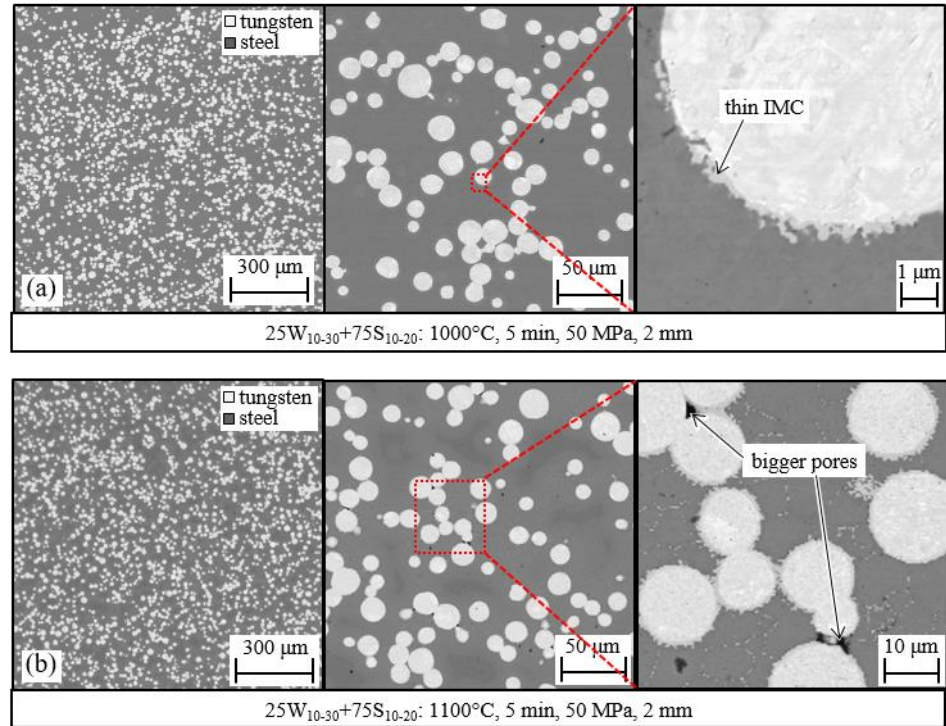


**Figure S2.** Technical drawing of the optimized punch and die made of graphite.

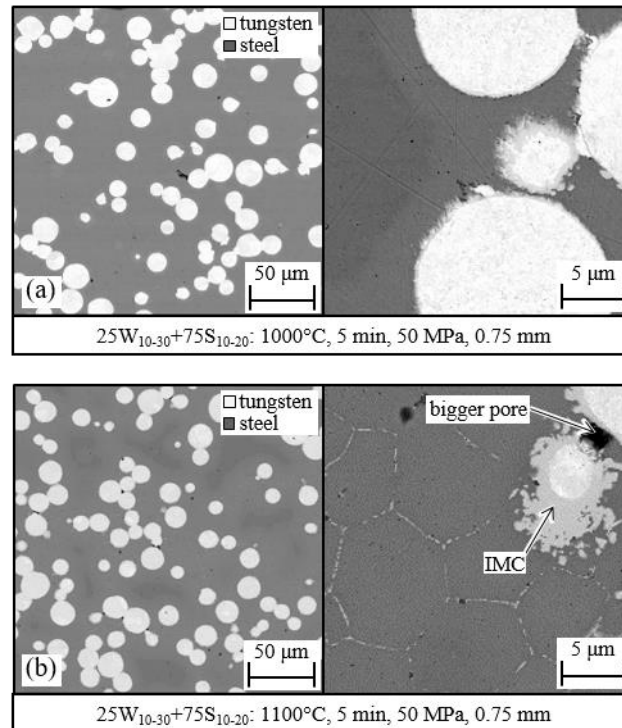
Additional SEM micrographs of sintered 25W composites



**Figure S3.** Cross-sectional SEM micrographs for 3 mm thick 25W composites sintered with the following parameter: (a) 900 °C, 5 min, 50 MPa, 3 mm; (b) 1000 °C, 5 min, 50 MPa, 3 mm; and (c) 1100 °C, 5 min, 50 MPa, 3 mm.



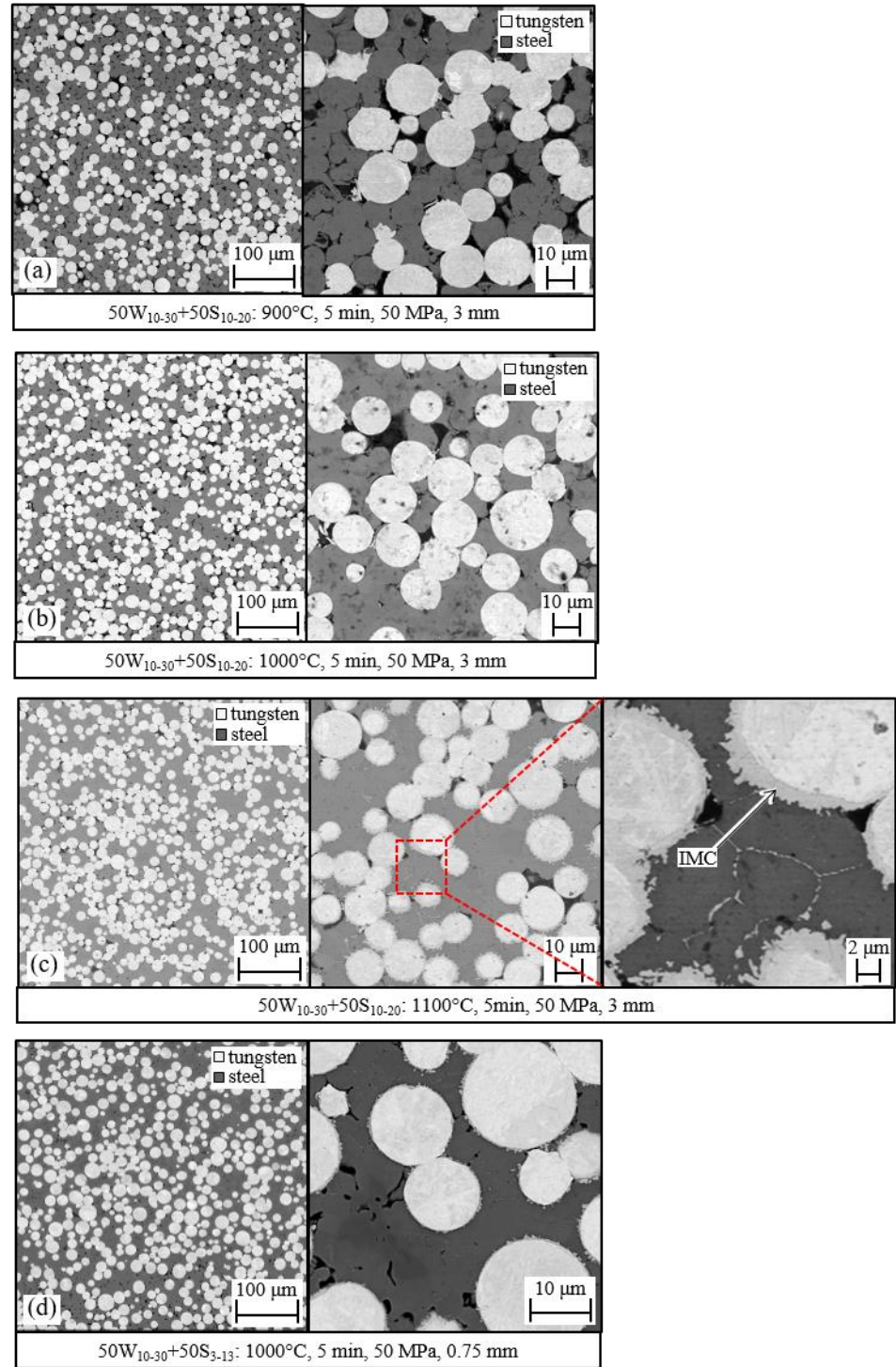
**Figure S4.** Cross-sectional SEM micrographs for 2 mm thick 25W composites sintered with the following parameter: (a) 1000 °C, 5 min, 50 MPa, 2 mm; and (b) 1100 °C, 5 min, 50 MPa, 2 mm.



**Figure S5.** Cross-sectional SEM micrographs for 0.75 mm thick 25W composites sintered with the following parameter: (a) 1000 °C, 5 min, 50 MPa, 0.75 mm; and (b) 1100 °C, 5 min, 50 MPa, 0.75 mm.

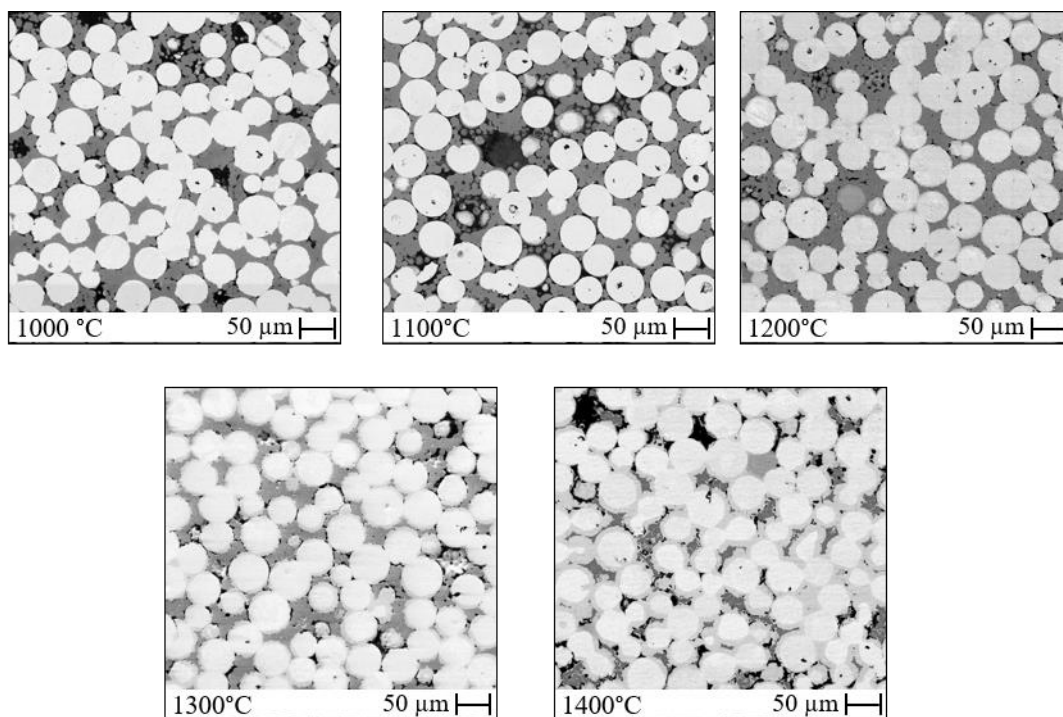


Additional SEM micrographs of sintered 50W composites

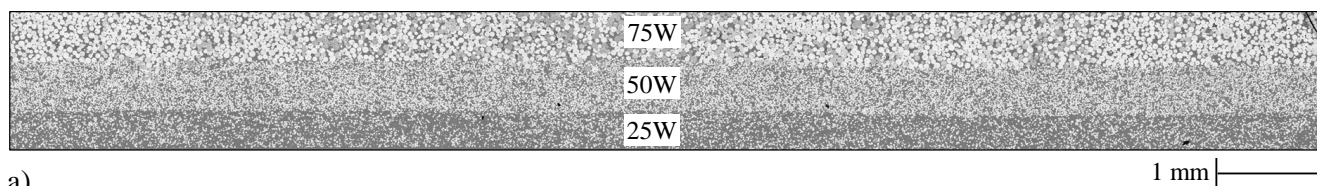


**Figure S6.** Cross-sectional SEM micrographs for 50W sintered composites with the following parameters: (a) 50W<sub>10-30</sub>+50S<sub>10-20</sub>, 900 °C, 5 min, 50 MPa, 3 mm; (b) 50W<sub>10-30</sub>+50S<sub>10-20</sub>, 1000 °C, 5 min, 50 MPa, 3 mm; (c) 50W<sub>10-30</sub>+50S<sub>10-20</sub>, 1100 °C, 5 min, 50 MPa, 3 mm; and (d) 50W<sub>10-30</sub>+50S<sub>3-13</sub>, 1000 °C, 5 min, 50 MPa, 0.75 mm.

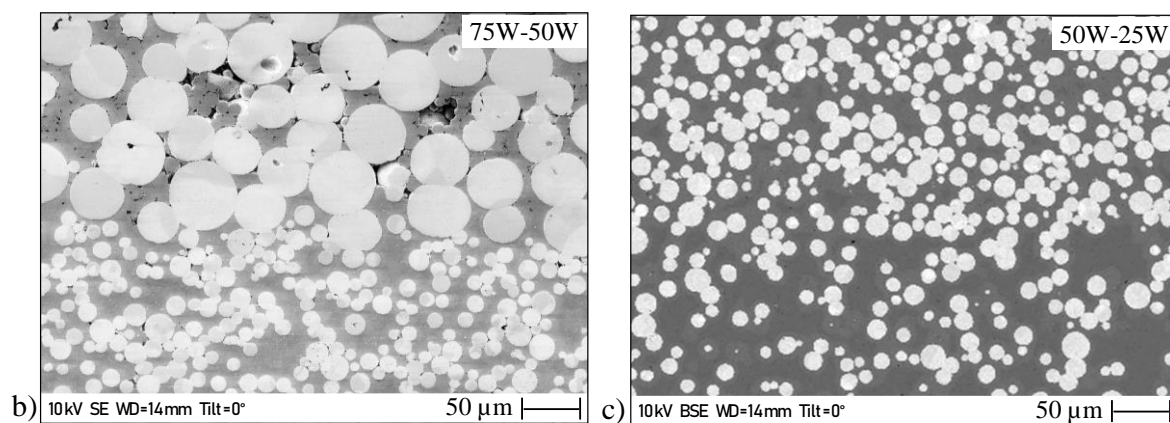
Additional SEM micrographs of sintered 75W composites



**Figure S7.** Cross-sectional SEM micrographs for 75W sintered at different sintering temperatures between 1000 °C and 1400 °C for 5 min.



a)



b)

c)

**Figure S8.** (a) Cross-sectional micrographs for manufactured FGM with three sublayers 25W, 50W and 75W; (b) Interface between 75W and 50W layer; (c) Interface between 50W and 25W layer.