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P4.203 Analytical and numerical calculations for the diffusion welding specimens on a Gleeble 3800 thermomechanical simulator

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Diffusion bonding methods as a candidate solution for Plasma Facing Components in fusion reactors involved significant investigations over the last decades. For diffusion bonding methods the Gleeble 3800 thermomechanical simulator provides a different method for the diffusion welding process: instead of having a furnace with radiation heating and axial forces in a vacuum chamber – the heating is performed by Joule heating with 50 Hz alternating current passed through the specimens by grips at the ends. Gleeble System is a general-purpose servo-hydraulic thermomechanical instrument, it applies direct resistance heating up to 10,000℃/second and apply maximum static pressure 20 t [Uniduna, 2016] under mid 10-5 Torr range. However not in a high vacuum chamber, since the chamber has rubber O-ring.
The system gives opportunity to monitor along the specimen the heat distribution as the function of thermal conductivity, electrical resistivity and the thermal behavior of the joining surfaces during diffusion welding. The joining surface has varying thermal conductance during the welding process, in this way the diffusion welding could be observed during its welding process. The transient thermal distributions of welded specimens was also investigated using the different grips, jaw models of the Gleeble system with high or reduced thermal conductance.
This poster and paper intend to summarize the calculations of temperature distributions along the specimens in steady state and transient case during welding processes and the thermal aspects of the mating surfaces during diffusion bonding. Further goal of this work is to understand better the newly developed fusion material as ODS steels weldability in diffusion processes.

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