740H Diffusion Bonded Compact Heat Exchanger for High Temperature and Pressure Applications 08535

High Strength 740H PCHE Successfully Demonstrated

1. Impact

CSP using Brayton cycle poses strenuous HX performance and cost requirements that are unmet by current technologies. 740H has the potential to break this bottleneck, provided that it can be incorporated in a cost-effective design and manufactured to maintain its material properties using an ASME qualified process.

2. Project Goal

-Develop diffusion bonded PCHE using 740H and CompRex's proprietary compact design

-Demonstrate improvement in HX strength and effectiveness over existing solutions

-Establish manufacturing best practices to prepare for ASME-qualification

3. Method(s)

-Establish baseline 740H material strength

-Develop procedures for each step in the manufacturing process

-Qualify procedures for ASME code with production of increasingly complex blocks

-Demonstrate suitability and integration in CSP with detailed quote and design for 1MWth HX

4. Outcome(s)

-740H material evaluation completed

-Manufacturing procedures developed

-ASME U and R certs obtained

-Bonded block has achieved strength properties close to that of 740H material

5. Conclusion/Risks

To achieve our goal, we plan to

-Refine manufacturing procedures to further improve block strength

-Demonstrate more complex 740H blocks and test for heat transfer effectiveness

-Develop design and cost estimate for 1MWth HX

6. Team

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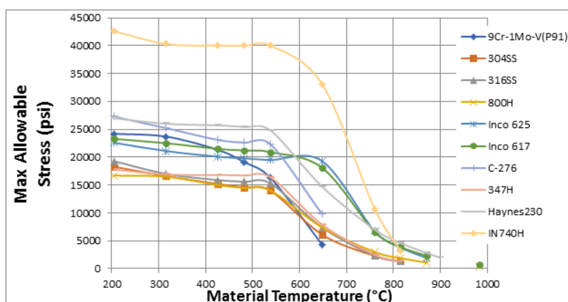

Figure 1. 740H stronger than most other metals and alloys, making it ideal for high T/ high P applications like CSP heat exchangers

Figure 2. Diffusion bonding furnace installed and operational

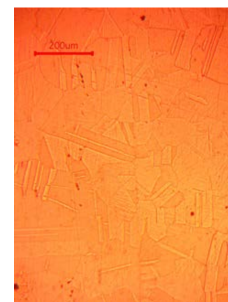

Figure 3. 740H bonded block showing no visible bonding line under ~250x magnification