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Project: Advancing Diffusion Bonding for Compact Heat Exchangers
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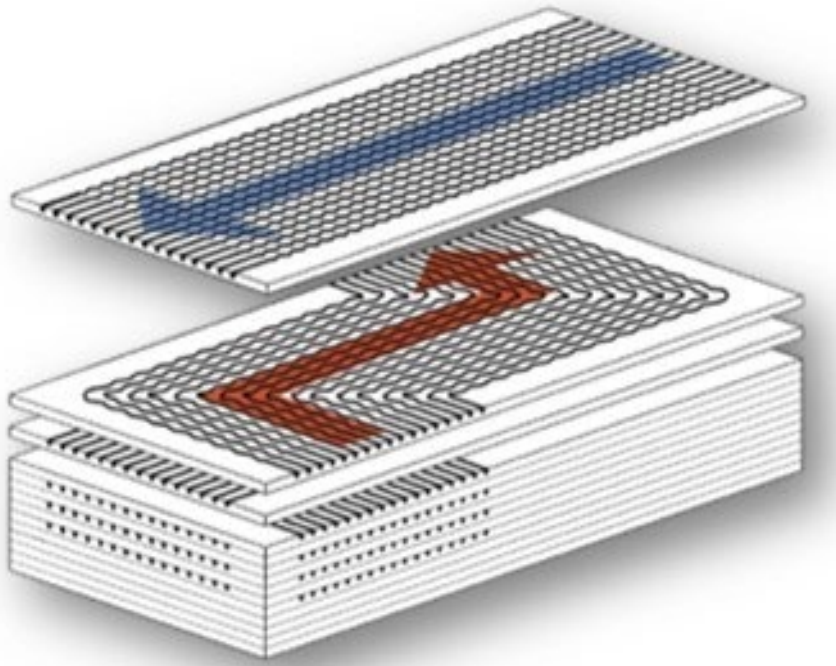
Sponsor: Department of Energy

THL Thermal Hydraulics Laboratory

Motivation

Compact heat exchangers have become an attractive addition to power cycles by reducing the material and space needed while improving efficiencies compared to a traditional heat exchanger. However, materials suited for high temperature and pressure environments have shown to have a reduction in material properties when diffusion bonded together. In order to incorporate diffusion bonded heat exchangers into the industry, a deeper understanding of the diffusion bonding process and its affect on the material properties must be known for the code cases.



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Project Goals

- To analyze material properties and grain structures of diffusion bonded Ni-based Alloy 617 and Stainless Steel 316H.
- To produce wrought material properties from a diffusion bond by optimizing the diffusion bonding parameters such as pressure, dwell time, temperature, and surface finish through experimentation.
- Development of acceptance criteria for ASME BPVC Section III, Division 5 applications

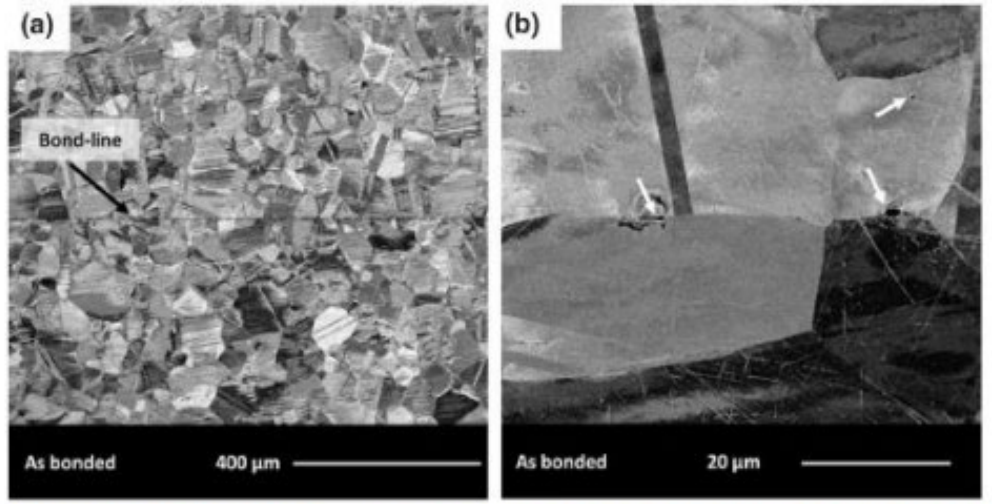

Figure 13: The bonding microstructures of 316 SS, where black dashed line indicates bond-line, while arrows denote Si/Al rich precipitates.

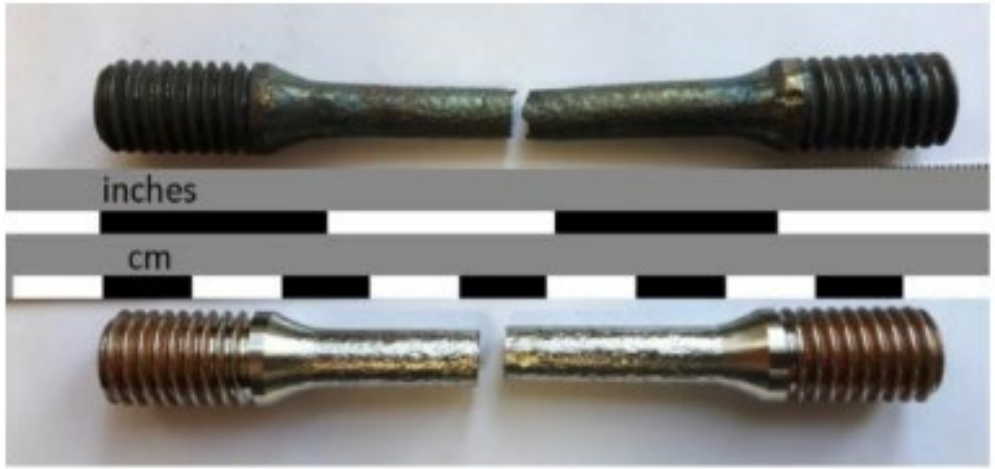

Figure 11: Alloy 617 diffusion- bonded samples tested at room temperature (bottom) and 750°C (Top)

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