Room Temperature Mechanical Properties and Microstructure Evolution of TIG/FCAW Welded AISI 347 and AISI 347 Clad A533B-1 Low Alloy Steel

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Structural materials are required for novel medical isotope generation facilities that operate in a low temperature and low-pressure environment. The structural components and supply lines are fabricated using a combination of tungsten inert gas (TIG) and flux cored arc welding process (FCAW). AISI 347 and AISI 347 clad A533B-1 low alloy steel are being evaluated as suitable materials for this application. This work presents microstructure and room temperature mechanical properties of TIG/FCAW welded AISI 347 and AISI 347 clad A533B-1 low alloy steel. Tensile testing was carried out on transverse specimens (with weldment in middle of gauge) to evaluate the quality of the weld. Tensile specimens were also machined from fusion zone (FZ), heat affected zone (HAZ) and base metal (BM). Charpy impact properties were tested with notch locations at FZ, HAZ and BM to evaluate effect of microstructural changes due to welding in these regions. The microstructural investigation using SEM and EBSD showed distinct features and grain sizes from weld to base metal. Fracture surface analysis using SEM was correlated with mechanical properties of both TIG/FCAW welded AISI 347 and AISI 347 clad A533B-1 low alloy steel. Future work will consider effect of neutron irradiation on microstructure and mechanical properties of these materials.

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