**2.4 Joining of 14YWT and F82H by Friction Stir Welding -** D. T. Hoelzer, M. A. Sokolov and Z. Feng (Oak Ridge National Laboratory)

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The feasibility of using friction stir welding (FSW) to join specimens of the advanced oxide dispersion strengthened (ODS) 14YWT nanostructured ferritic alloy (NFA) and a plate of F82H tempered martensitic steel (TMS) was investigated. The sample used in the FSW experiment consisted of spot welding four specimens of 14YWT that were prepared from prior tested dual notch fracture toughness bend bars, into a corresponding slot that was machined in a F82H plate. Successful FSW was performed using a polycrystalline boron nitride tool (PCBN). Bonding (i.e., welds) between both 14YWT/14YWT plate and 14YWT/ F82H plate was successful. Joints, characterized by light microscopy and SEM analysis, were observed to be relatively narrow in width. The ultra-fine grain size associated with 14YWT increased by a factor of up to 3 while that of F82H was refined by a considerable amount in the thermomechanically affected zones (TMAZ) due to FSW. In addition, porosity was observed in the TMAZ of 14YWT on both the advancing side of the FSW joint and at the interface between F82H and 14YWT. Vickers hardness (VH) measurements from the FSW zones showed an ~20% decrease in hardness of 14YWT (from ~500 VH to ~380VH) and an ~100% increase in hardness of F82H (from ~220 VH to ~440VH). Further refinements in the FSW process will be required to minimize defects including porosity.