

PNNL-35900

# **Oxide Dispersion Strengthened Ferritic Steel Wire Feedstock Development for Large Format Additive Manufacturing (Abstract)**

CRADA #620 (PNNL # 80918)

August 2023

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Commonwealth Fusion Systems (CFS)

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Abstract

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Prepared for  
the U.S. Department of Energy  
under Contract DE-AC05-76RL01830

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## Abstract

This CRADA project funded through DOE's INFUSE program seeks to demonstrate the viability of fabricating large, complex parts from oxide dispersion strengthened (ODS) steel with advanced manufacturing. Exhibiting excellent radiation tolerance and high mechanical performance at elevated temperatures, ODS steel is a promising structural material candidate for near-plasma components in fusion energy systems. Its use, however, has been limited by a lack of manufacturability. This project will seek to produce ODS steel wire through a solid-state shear assisted extrusion process and then demonstrate that the wire can undergo controlled local melting while being welded with the final part sufficiently retaining the beneficial properties of ODS steel. This would allow the use of wire-arc additive manufacturing (WAAM) to manufacture large-scale ODS parts, even though ODS is currently only available as a powder. WAAM is a promising technique for producing components like the replaceable ARC vacuum vessel in CFS' fusion reactor design. Meanwhile, this project will also expand PNNL's capability in producing custom wire feedstock with friction extrusion, enabling downstream large-scale manufacturing with WAAM and solid-state based additive manufacturing.

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