Research on Advanced Cooling Systems Based on Oxide Dispersion Strengthened Alloys and Bionic Porous Structure

Project Description:

Gas turbines and jet engines require increasingly effective heat protection technologies as efficiencies rise. This project aims to address heat protection challenges for turbine blades through an integrated materials and design approach. Advanced cooling systems will be developed utilizing oxide dispersion strengthened (ODS) high-temperature alloys optimized for heat transfer. An integrated computational materials engineering (ICME) framework will be established through thermodynamic calculation with high-throughput screening to master the alloy design method of ODS alloys. The influence of microstructure evolutions on the high-temperature performance through creep and oxidation experiments will be analyzed to establish the optimal parameter interval for additive manufacturing and post-processing.

Job Description:

We are seeking a highly motivated research fellow to support development of advanced cooling systems utilizing oxide dispersion strengthened alloys. The successful candidate will play a key role in establishing computational models and experimental techniques to advance alloy design and high temperature performance.

The research scholar will be responsible for:

- Developing an Integrated Computational Materials Engineering (ICME) framework using CALPHAD thermodynamic modelling to enable high-throughput screening of alloy compositions.
- Establishing a processing parameter-microstructure-high temperature performance calculation model based on CALPHAD.
- Combining high throughput simulation-experiment hybrid techniques with additive manufacturing to support ICME model calibration and prediction.
- Coauthoring one SCI journal paper per year.

Throughout the experience as a Focused Research Extended Experience (FREE) research fellow, the candidate would gain valuable hands-on research experience, advancing both the research and own careers.

The term of employment spans two years, and the contract is structured for annual renewal.

Qualifications:

- A master's or bachelor's degree in Materials Science and Engineering or related field, with expertise in computational thermodynamics, additive manufacturing, and/or integrated computational materials engineering.
- Proficiency with CALPHAD modelling, computational tools such as MATLAB and Python.
- Materials characterization techniques is preferred.