Nickel Alloys as Fusion Reactor Plasma-Facing Materials
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Goal
Determine the operating temperature range and maximum fluence of hydrogen and helium allowed for nickel alloys as plasma-facing components in fusion reactors (such as DT, DD, D³He, p¹¹B).

Previous Experiments
• Severe damage occurred
• Focused-Ion Beam results of W after ion irradiation

Experimental Approach
• The MITE-E is used to simulate fusion reactor conditions. Samples can be irradiated with He or D under specific conditions:
  • Temperatures between 500 and 1200 °C.
  • Ions with energies from 10 to 150 keV with ion currents of 75±3.8 μA, a flux of 4.7x10¹⁴ ions/cm²s.
  • Fluences of 1.0x10¹⁷ to 1.0x10¹⁹ ions/cm².
• A variable power Nd:YAG laser provides additional sample heating.
• The MITE-E typically uses a sample size of ~1cm x 1cm x 1mm.
• To determine physical changes in a sample analysis can be done with Focused-Ion Beam, Scanning Electron Microscope, mass loss measurements, and other techniques.

Nickel Alloys to be tested
• Inconel 600, 625, 718, 740
• Incoloy 800, 825

Future Work
Analyze several nickel alloys at 900 °C with a fluence up to 1.0x10¹⁸ ions/cm² to determine the effects of He and H. This simulation of a reactor setting will help evaluate first-wall use of a nickel alloy.

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