

Helium Ion Irradiation Resistance in Additively Manufactured 316L Stainless Steel and CoCrFeNi High-Entropy Alloy

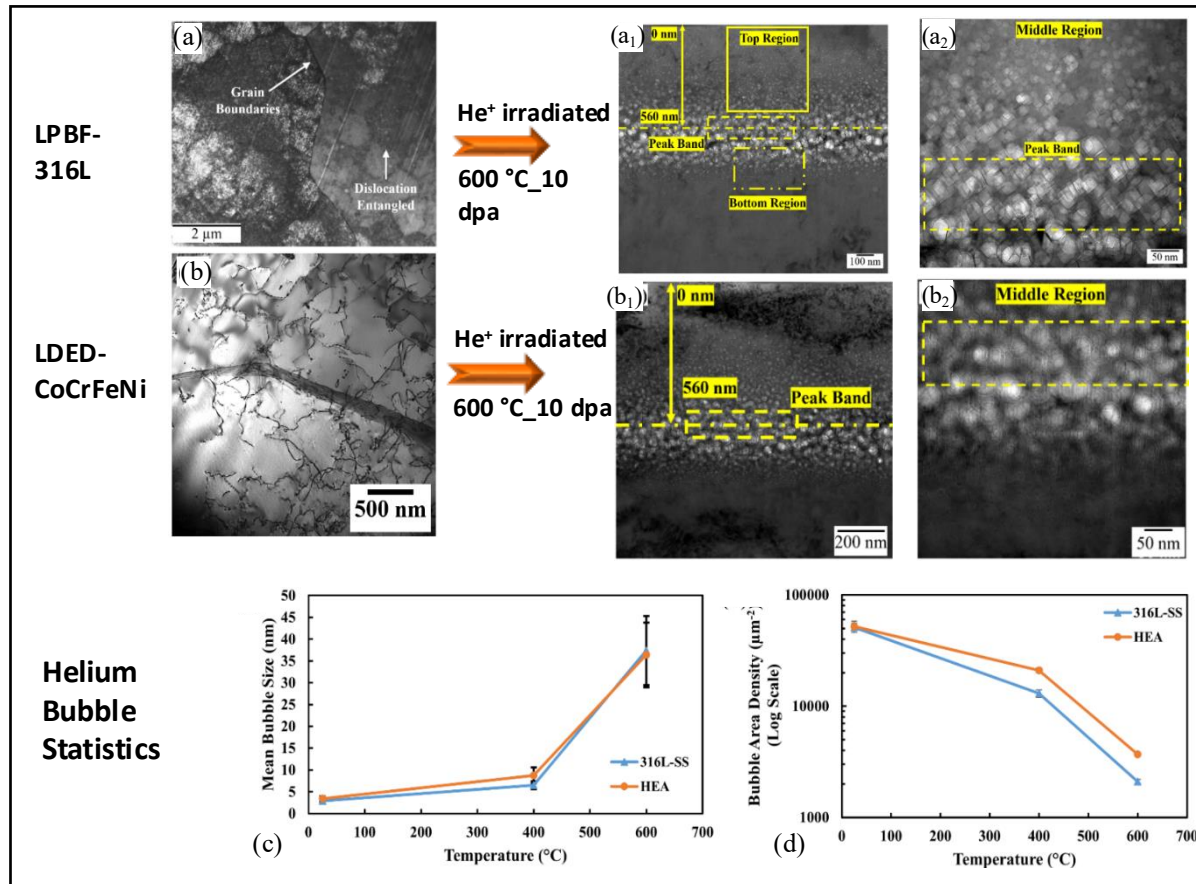


Figure: (a, b) Pre-irradiation TEM images of LPBF 316L and LDED CoCrFeNi high-entropy alloy (HEA), respectively. (a₁, a₂) and (b₁, b₂) Corresponding TEM images of LPBF 316L and LDED CoCrFeNi HEA after He irradiation at 600 °C to 10 dpa. (c, d) Statistical results of helium bubbles, including mean bubble size and bubble area density.

Scientific Achievement

A CINT User Team reveals how AM-induced microstructure, alloy chemistry, and temperature collectively influence irradiation damage and provides guidance for radiation-tolerant alloy design.

Significance and Impact

Direct quantitative comparison of helium bubble evolution in AM LPBF 316L and LDED CoCrFeNi reveals distinct irradiation responses under identical irradiation conditions.

Research Details

- 200 keV He⁺ irradiation to 10 dpa at 25 °C, 400 °C, and 600 °C.
- TEM-based quantification of bubble size and areal density in the peak-damage region.

Dixit, S.; Li, J.; Wang, Y.; Chen, W.-Y.; Liu, S. Comparative Study on Helium Ion Irradiation Resistance in Additively Manufactured 316L Stainless Steel and CoCrFeNi High-Entropy Alloy. Appl. Sci. 2026.

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