Inconel 718 (In718) is one of the most used Ni-based superalloys in jet engine applications:

- High oxidation/corrosion resistance
- High creep resistance
- High mechanical strength

**Good weldability**

No cracks in final PBF part

The powder bed is selectively melted by a laser beam:
- High thermal gradients
- High residual stresses
- Inhomogeneous microstructure

**SEM and XCT were performed at specific points along the creep curve**

**Chosen voxel size (15 µm) was found to be too big**

**Insufficient resolution**

- **r-type voids** are generated at the GB, resulting in V-shaped cracks
- Large part of porosity development is produced during late tertiary creep (last 100h)
- Failure occurs because of damage accumulation

**A PBF induced melt pool substructure survived HT**

**Columnar grains** grow towards the melt pool centre, along the local maximum thermal gradient direction (Fig.9)

**Perspectives**

Defect generation and evolution during creep were characterised, however XCT failed to give appreciable results

Reduce voxel size or use another non-destructive technique such as Ultrasonic Testing (UT)

Building orientation showed an influence on PBF In718 creep performance, producing different fracture surface appearances

Intermediate angles (e.g. 60°, 75°) should be used to study the transition between these two failure mechanisms

References


