Figure 1

(a) Al₂O₃ Piston

(b) Strain marker

(c) Brg

(d) 10 µm

(b) 100 µm

Brg

Strain marker

Al₂O₃ Piston

X

Y

Z
Figure 2

(a) Multiple of uniform density

(b) \( \dot{\gamma} \sim 0.8 \)  
\( \dot{\gamma} \sim 2 \times 10^{-4} \) /s

Shear direction

Multiple of uniform density
Figure 3

(a) (b)

(c) (d)
Extended data figure 1

(a)  
(b)  

MgO+Cr$_2$O$_3$
LaCrO$_3$-heater
Al$_2$O$_3$
MgO
Sample
Pt foil
Ni foil
(strain marker)
Extended data figure 2
Extended data figure 3

![Graph showing D-ram Load (ton) and D-ram Stroke (mm) over time (min).](image-url)

- **D-ram Load (ton)**
- **D-ram Stroke (mm)**

**Key Events**
- **Start of deformation**
- **Reached 1873 K**
- **End of deformation and quench**

**Legend**
- **Load (top)**
- **Load (bottom)**
- **Stroke (top)**
- **Stroke (bottom)**
Expanded data figure 4
(a) 2D X-ray diffraction pattern of deformation sample

(b) 1D X-ray diffraction pattern of deformation sample

2θ(°)

Intensity

Al₂O₃
Brg(002+110)
Brg(111)
Brg(112)
Brg(210)
Brg(022) Brg (202)
Brg(113)
Brg(122)
Brg(212)
Brg(023)
Brg(221)

Al₂O₃ + Brg(002+110)
Al₂O₃ + Brg(004+220)
Extended data figure 6

(a) (111)

Normalized intensity vs Azimuth angle (°)

(b) (020)

Normalized intensity vs Azimuth angle (°)

(c) (120)

Normalized intensity vs Azimuth angle (°)

(d) (210)

Normalized intensity vs Azimuth angle (°)

(e) (022)

Normalized intensity vs Azimuth angle (°)

(f) (202)

Normalized intensity vs Azimuth angle (°)
Extended data figure 6

(g) (113)

(h) (122)

(i) (212)

(j) (023)

(k) (221)