JOURNAL OF APPLIED CRYSTALLOGRAPHY

Volume 56 (2023)

Supporting information for article:

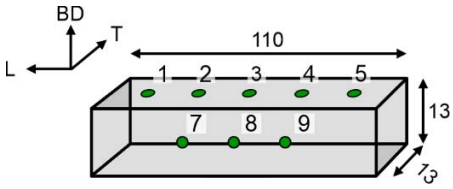
Texture-based residual stress analysis of laser powder bed fused Inconel 718 parts

Jakob Schröder, Alexander Evans, Vladimir Luzin, Guilherme Abreu Faria, Sebastian Degener, Efthymios Polatidis, Jan Čapek, Arne Kromm, Gleb Dovzhenko and Giovanni Bruno

***Table S1**: Overview of the measurement conditions for the different diffraction techniques.*

Technique	radiation	reflection Diffraction angle	ψ/χ-tilting (steps)	φ-tilting (steps)	assumptions
Laboratory XRD Xstress G3	Monochromatic, Mnk_{α}	Ni-311 $2\theta \approx 156°$	-45° to 45° (19)	0°, 90°	Top: $\sigma_{i3} = 0$ $\sigma_{12} = 0$ Side: $\sigma_{i1} = 0$ $\sigma_{23} = 0$
Synchrotron XRD P61A	Energy dispersive, 30 - 200 keV	Ni - 311 $E \approx 55$ keV $2\theta \approx 11.946°$	0 to 80° (20)	0 - 360° 3, 7, 8 ,9 (5°) 1, 2, 4, 5 (15°)	-
Neutron diffraction POLDI	Time of flight, $Q \approx 1\text{-}8\ 2\pi d^{-1}$	$2\theta \approx 90° \pm 15°$	2 orthogonal directions (BD, T)		-
Neutron diffraction KOWARI	Monochromatic, $\lambda = 1.53$ Å	Ni-311 $2\theta \approx 90°$	3 orthogonal directions (BD, T, L)		

Table S2: *Obtained eigenvalues for the top surfaces of the specimen $H_{0°}$ and $H_{45°}$ according to the measurement positions 1-9 acquired by energy dispersive synchrotron diffraction.*



$H_{45°}$	#d^{311}	$\sigma'_T-\sigma'_{BD}$ /MPa	$\sigma'_L-\sigma'_{BD}$ /MPa	φ_p /°	$H_{0°}$	#d^{311}	$\sigma'_T-\sigma'_{BD}$ /MPa	$\sigma'_L-\sigma'_{BD}$ /MPa	φ_p /°
1	381	414 ± 18	265 ± 18	21.9 ± 3.6	**1**	384	392 ± 20	300 ± 20	8.3 ± 7
2	382	381 ± 18	46 ± 17	8.8 ± 1.1	**2**	384	393 ± 19	172 ± 19	-1.0 ± 0.8
3	1863	255 ± 8	57 ± 8	18.5 ± 1.1	**3**	1833	384 ± 9	178 ± 9	0 ± 0.6
4	382	367 ± 17	92 ± 17	12.3 ± 1.4	**4**	384	383 ± 18	154 ± 17	4.2 ± 1.4
5	377	387 ± 19	209 ± 19	17.6 ± 2.8	**5**	383	371 ± 18	256 ± 17	7.5 ± 3.3
$H_{45°}$	#d^{311}	$\sigma'_{BD}-\sigma'_T$ /MPa	$\sigma'_L-\sigma'_T$ /MPa	φ_p /°	$H_{0°}$	#d^{311}	$\sigma'_{BD}-\sigma'_T$ /MPa	$\sigma'_L-\sigma'_T$ /MPa	φ_p /°
7	1511	265 ± 9	12 ± 7	-0.5 ± 0.7	**7**	1512	391 ± 10	96 ± 9	-1.3 ± 0.5
8	1512	257 ± 9	17 ± 7	-2.4 ± 0.6	**8**	-	-	-	-
9	1512	278 ± 8	10 ± 4	-2.0 ± 0.6	**9**	1512	399 ± 10	61 ± 8	-4.2 ± 0.5