Supplementary Information

Synchronized Multi-Laser Powder Bed Fusion (M-LPBF): A Technique for Controlling Microstructure for Additive Manufacturing of Ti-6Al-4V

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Table S1. Density, thermal conductivity, and specific heat of the Ti-6Al-4V[1].

Temperature (K)	Density (kg/m^3)	Thermal Conductivity (W/m·K)	Specific Heat (J/K·kg)
298	4420	7	546
373	4406	7.45	562
473	4395	8.75	584
573	4381	10.15	606
673	4366	11.35	629
773	4350	12.6	651
873	4336	14.2	673
973	4324	15.5	694
1073	4309	17.8	714
1173	4294	20.2	734
1273	4282	19.3	641
1373	4267	21	660
1473	4252	22.9	678
1573	4240	23.7	696
1673	4225	24.6	714
1773	4205	25.8	732
1873	4198	27	-

The nondimensional parameters, dimensionless heat input (E*) and dimensionless scanning velocity (v*), were used to ensure that the selected laser power and speed values result in printing in the conduction regime [2]. The only dubious point is P=500 W and v=100 mm/s corresponding to the keyholing regime's borderline.

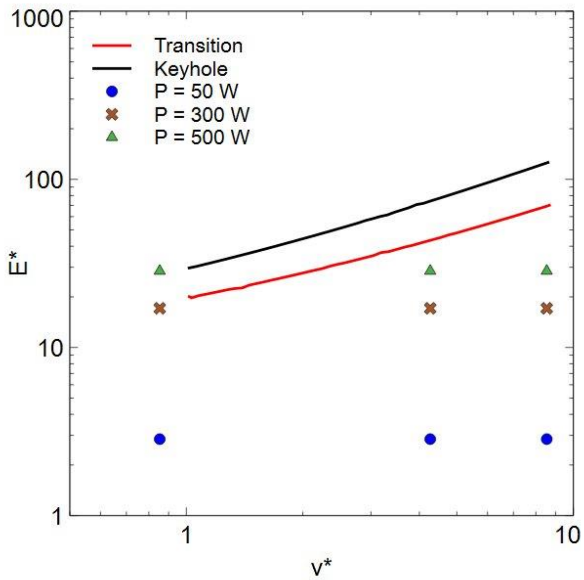

Figure S1. Processing diagram of Ti-6Al-4V for LPBF using dimensionless heat input(E*) and dimensionless laser velocity(v∗).

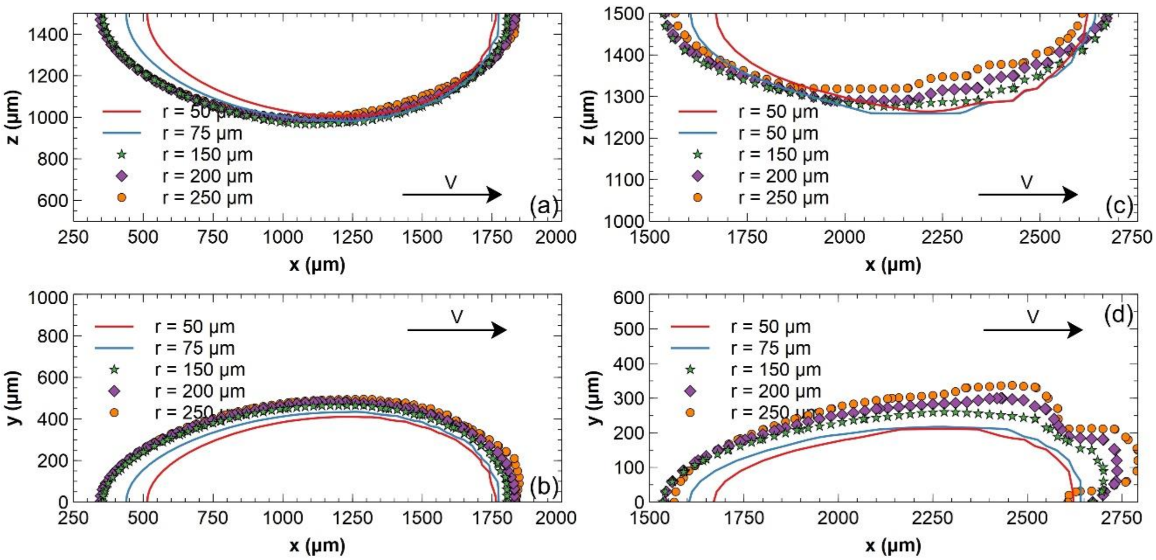

Figure S2. The melt pool shape on the x-z and y-z planes for P=300W and v=100-500 mm/s. a-b) v=100 mm/s, c-d) v=500 mm/s

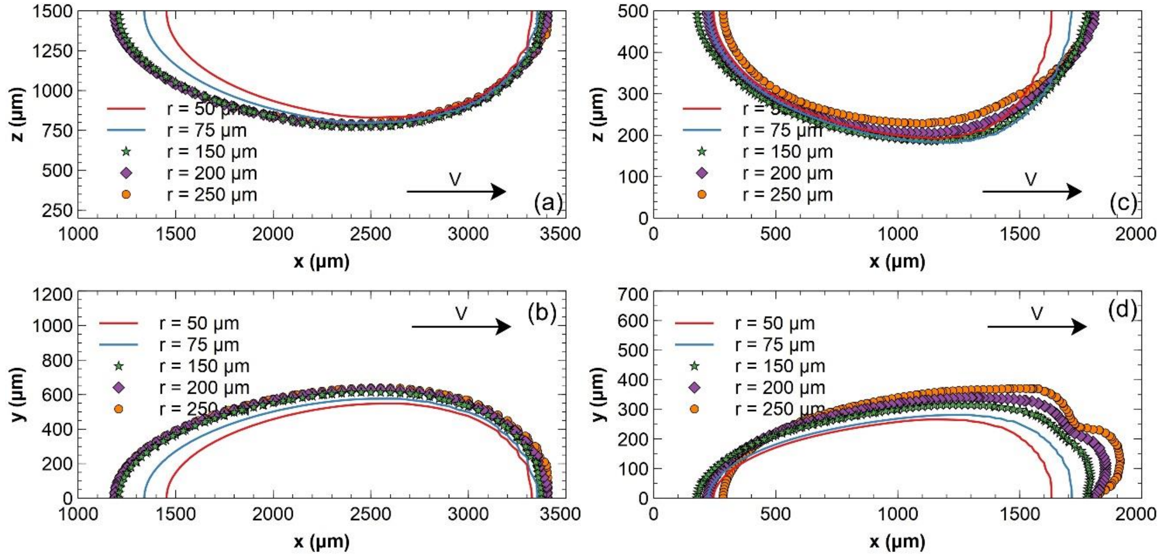

Figure S3. The melt pool shape on the x-z and y-z planes for P=500W and v=100-500 mm/s. a-b) v=100 mm/s, c-d) v=500 mm/s

[1] K.C. Mills, Recommended values of thermophysical properties for selected commercial alloys , Woodhead Publishing, 2002.

[2] S. Patel, M. Vlasea, Melting modes in laser powder bed fusion, Materialia. 9 (2020) 100591. https://doi.org/10.1016/J.MTLA.2020.100591.