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Effects of powder characteristics and chemical composition on the properties of 25Cr7Ni stainless steel fabricated by laser-powder bed fusion and evaluation of process simulation

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Abstract
The 25Cr7Ni stainless steel alloy system is gaining increasing interest in the oil and gas industry because of its combination of high strength and corrosion resistance properties. However, very few studies on the effects of starting powder attributes and chemical composition on the as-printed properties of 25Cr7Ni stainless steel fabri

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Effects of Powder Characteristics and Chemical Composition on the Properties of 25Cr7Ni Stainless Steel Fabricated by Laser-Powder Bed Fusion and Evaluation of Process Simulation

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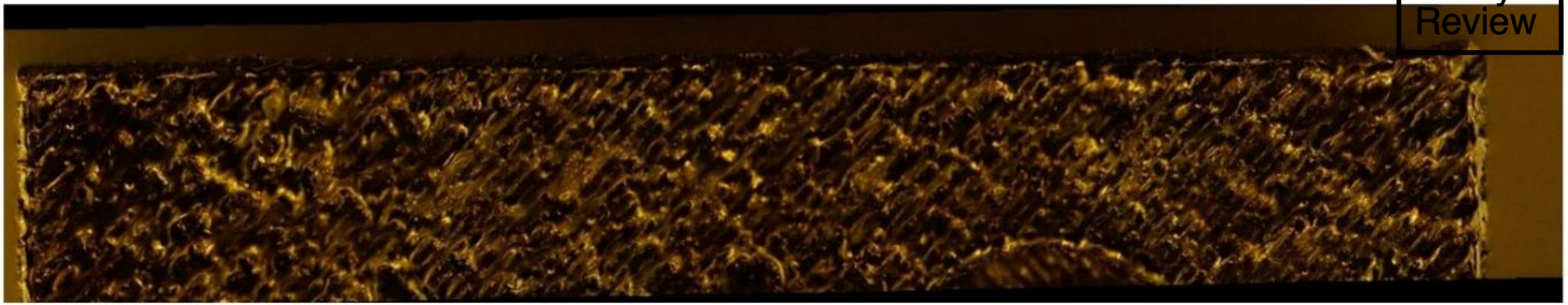

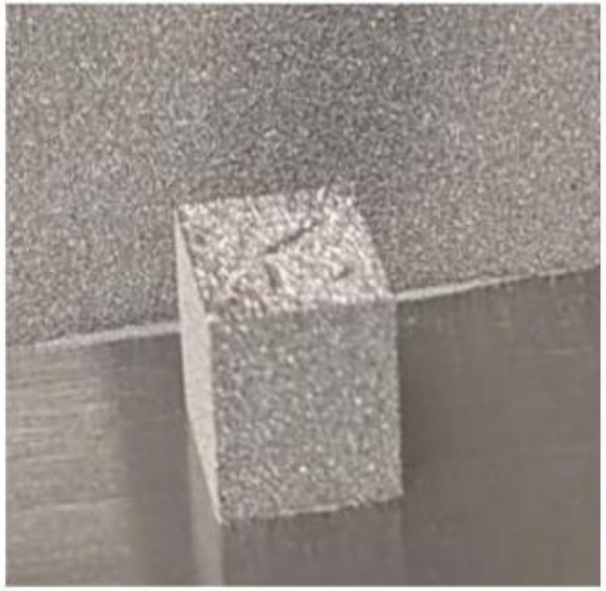

Overall Length	Before Cutting (Simulation)	Before Cutting(Experimental)
X Direction	10.10	10.13
Y Direction	8.06	8.07
Z Direction	9.8	9.815

Akilan AA, Kumar S, Shaikh MQ, Enneti RK, Atre SV. Effects of Powder Characteristics and Chemical Composition on the Properties of 25Cr7Ni Stainless Steel Fabricated by Laser-Powder Bed Fusion and Evaluation of Process Simulation. Metals. 2023 Aug 16;13(8):1476.

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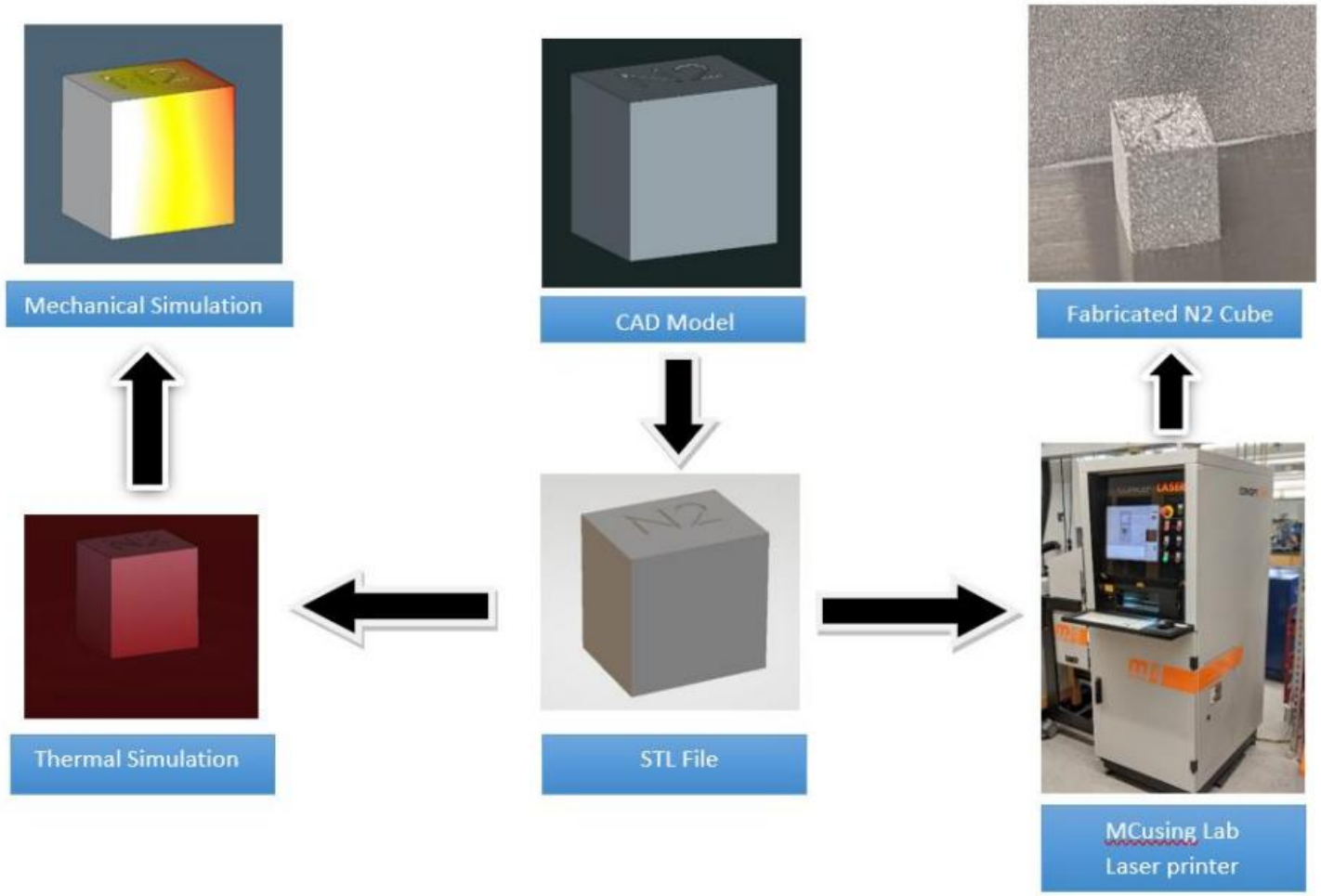

S.No	Material Properties	Value
1	Density	7.7 g/cc
2	Yield Strength	650 MPa
3	Ultimate Tensile Strength	870 MPa

Experimentally observed values

S.No	Simulation Parameter	Value
1	Machine Type	Mlab Cusing
2	Maximum laser (W)	90
3	Maximum laser speed (mm/s)	600
4	Laser thickness (mm)	0.02
5	Scan width (mm)	0.12
6	Build space dimension (mm)	100 X 100 X 100

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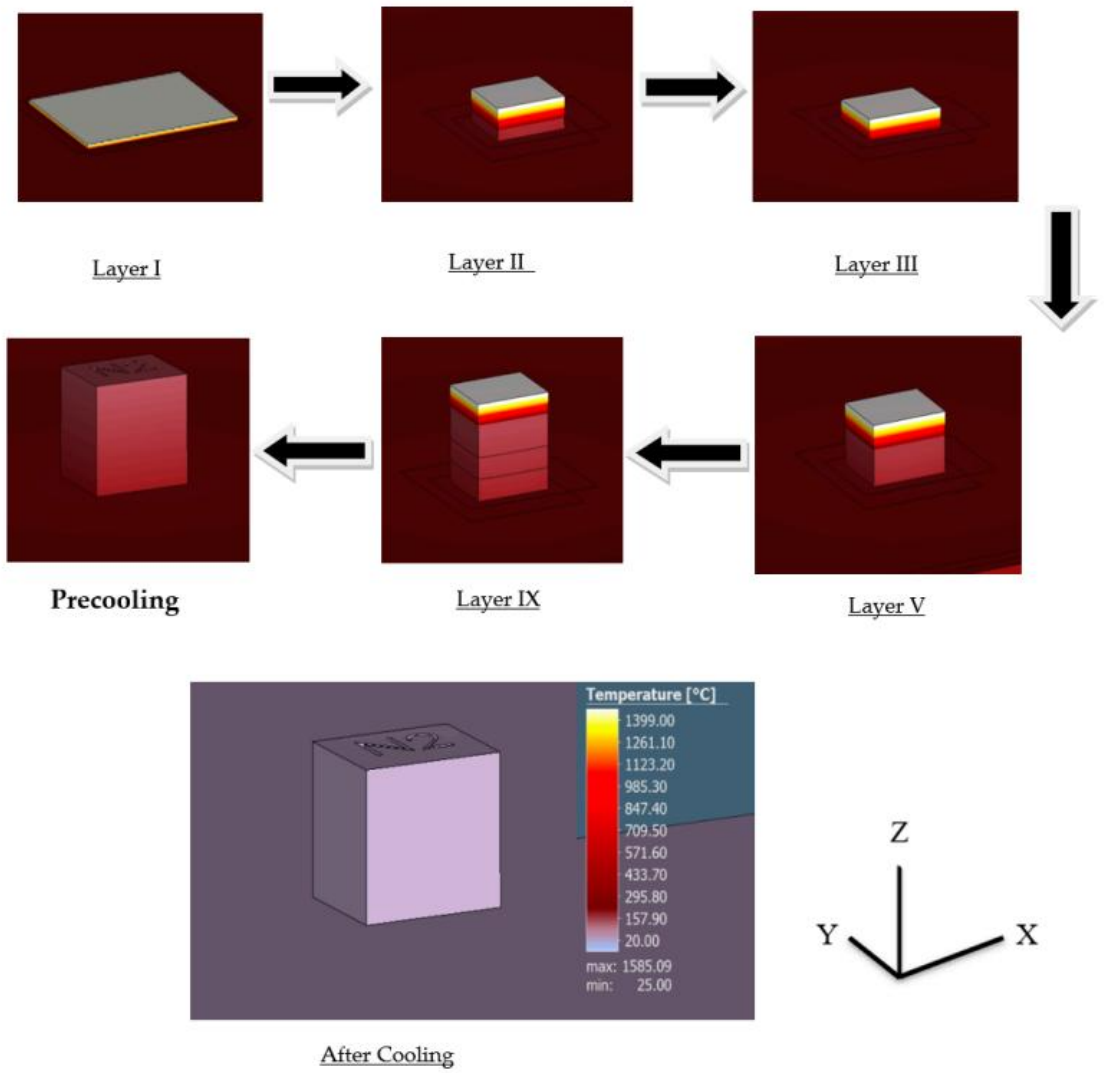

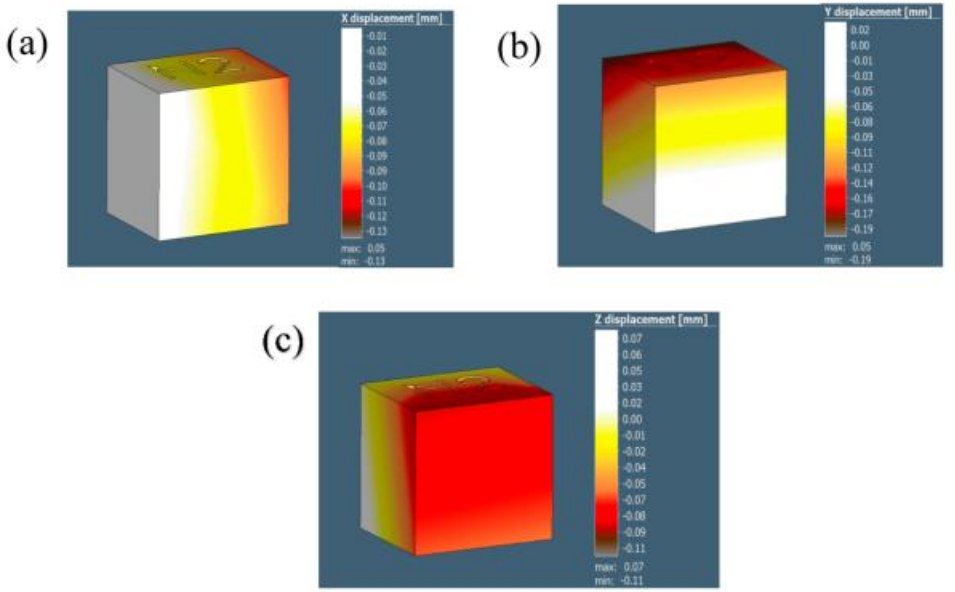

Figure 11. Layer by layer thermal simulation results.

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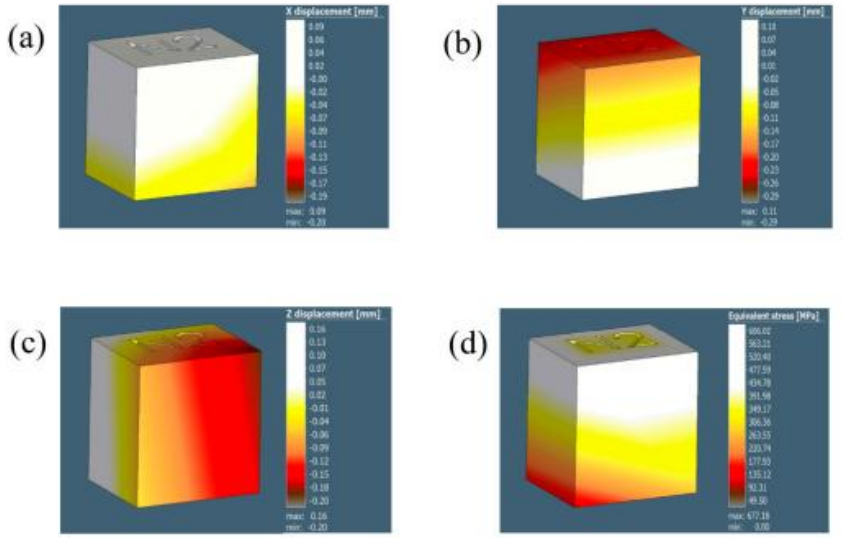

Figure A1. The illustrations in (**a**–**d**) show the displacements results for the 0.8 mm voxel size in the X, Y, and Z direction and thquivalent stress, respectively.

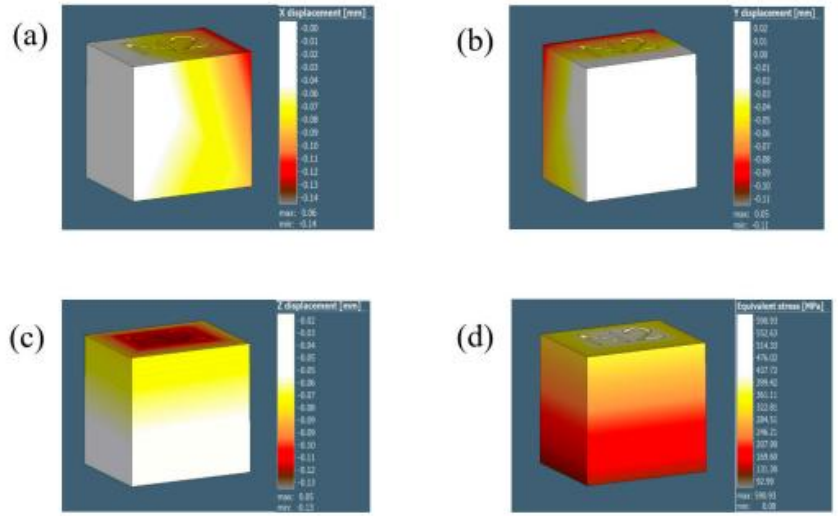

Figure A2. The illustrations in (**a**–**d**) show the displacement results for the 1 mm voxel size in the X, Y, and Z direction and the equivalent stress, respectively.

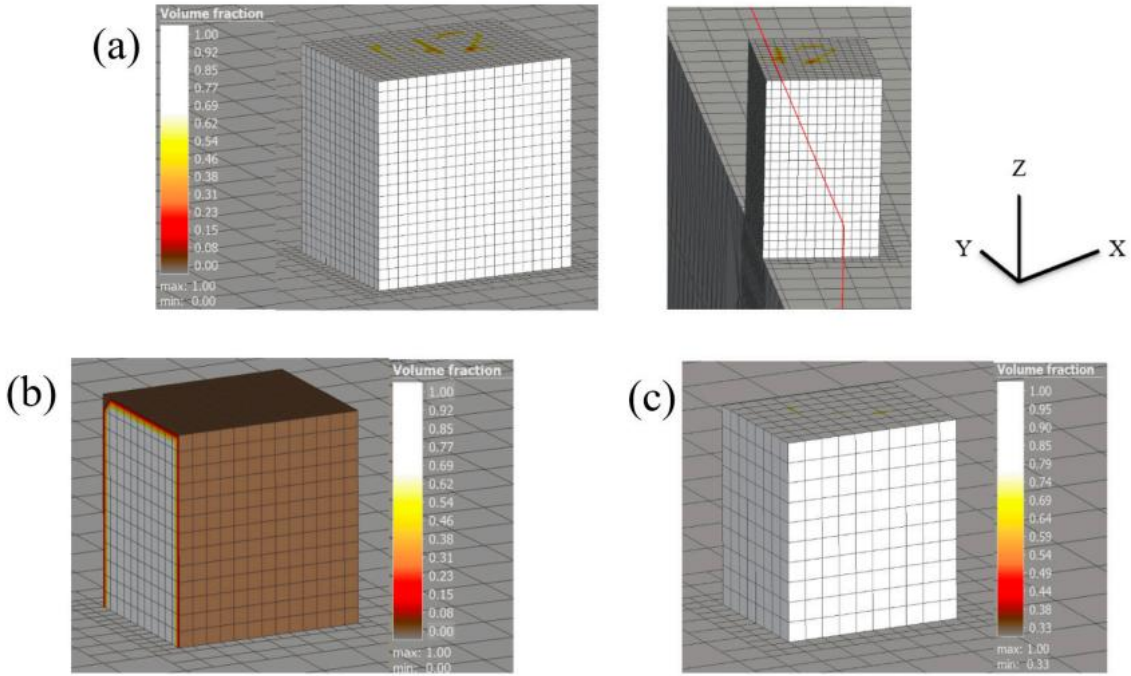

Figure A3. The illustrations in (**a**–**c**) show the dispalcement results for the 0.5, 0.8 mm, and 1 mm voxel size, respectively.