

Supplementary Materials

In Situ and Ex Situ Characterization of the Microstructure Formation in Ni-Cr-Si Alloys during Rapid Solidification – toward Alloy Design for Laser Additive Manufacturing

Table S1. List of Crystallographic Parameters of Phases Referred in Present Work [Liu, X., et al.: Experimental Investigation of Phase Equilibria in the Ni-Cr-Si Ternary System. *J. Phase Equilibria Diffus.* 35, 334–342 (2014); Gupta, K.P.: The Cr-Ni-Si (Chromium-Nickel-Silicon) System. *J. Phase Equilibria Diffus.* 27, 523–528 (2006).].

Phase	Type	Pearson Symbol	Space Group	<i>a</i> [Å]	<i>b</i> [Å]	<i>c</i> [Å]	β [°]
(Ni)	Cu	<i>cF4</i>	<i>Fm-3m</i>	3.552	–	–	90
β_1 -Ni ₃ Si	AuCu ₃	<i>cP4</i>	<i>Pm-3m</i>	3.50	–	–	90
β_3 -Ni ₃ Si	–	<i>mC16</i>	–	7.04	6.26	5.08	48.84
γ -Ni ₃₁ Si ₁₂	Ni ₃₁ Si ₁₂	<i>hP43</i>	<i>P321</i>	6.67	–	12.28	90
δ -Ni ₂ Si	Co ₂ Si	<i>oP12</i>	<i>Pnma</i>	7.06	4.99	3.72	90
σ -Cr ₁₃ Ni ₅ Si	σ (Cr,Fe)	<i>tP30</i>	<i>P42/mnm</i>	8.787	–	4.570	90
π -Cr ₃ Ni ₅ Si ₂	AlAu ₄	<i>cP20</i>	<i>P213</i>	6.120	–	–	90
τ -Cr ₆ Ni ₁₆ Si ₇	Mg ₆ Cu ₁₆ Si ₇	<i>cF116</i>	<i>Fm-3m</i>	11.10	–	–	90

Table S2. Table of relevant invariant reactions [Schuster, J.C., Du, Y.: Experimental investigation and thermodynamic modeling of the Cr-Ni-Si system. *Metall. Mater. Trans. A.* 31, 1795–1803 (2000)].

Ni-Si	Ni-Cr-Si
e7: L \leftrightarrow θ + δ -Ni ₂ Si, T = 1240 °C	E1: L \leftrightarrow Cr ₃ Si + γ -Ni ₃₁ Si ₁₂ + δ -Ni ₂ Si T = 1138 °C
e9: L \leftrightarrow (Ni) + β_3 -Ni ₃ Si, T = 1151 °C	E2: L \leftrightarrow (Ni) + π -Cr ₃ Ni ₅ Si ₂ + γ -Ni ₃₁ Si ₁₂ T = 1082 °C
p5: L + γ -Ni ₃₁ Si ₁₂ \leftrightarrow β_3 -Ni ₃ Si, T = 1199 °C	U6: L + Cr ₃ Si \leftrightarrow γ -Ni ₃₁ Si ₁₂ + τ_1 T = 1126 °C
-	U8: L + β_2 - \leftrightarrow (Ni) + γ -Ni ₃₁ Si ₁₂ T = 1119 °C
-	U9: L + τ_1 \leftrightarrow γ -Ni ₃₁ Si ₁₂ + π -Cr ₃ Ni ₅ Si ₂ T = 1088 °C

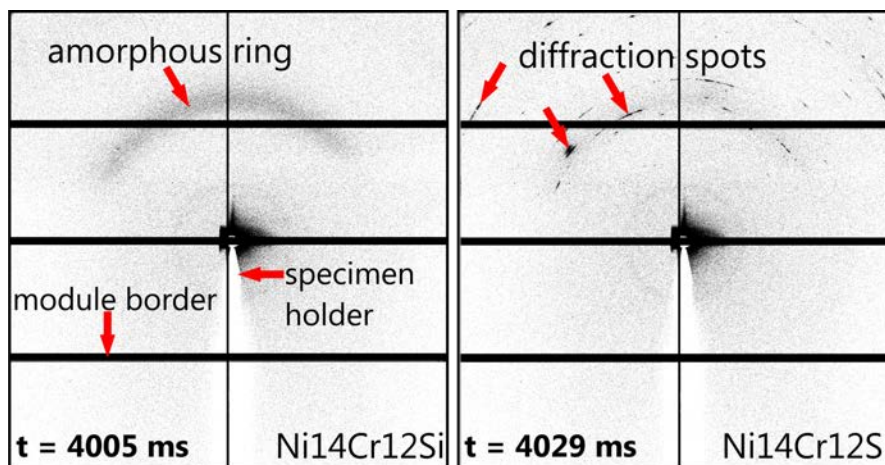


Figure S1. 2D pattern of amorphous ring of hot melt at $t = 4005$ ms (left image) and diffraction spots of solidified crystals (right image) at $t = 4029$ ms in the Ni14Cr12Si alloy.