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Supporting information for article:

Stress-induced detwinning and martensite transformation in an austenite Ni–Mn–Ga alloy with martensite cluster under uniaxial loading

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Table S1 Minimum misorientation angle and the two near-180° misorientation angles, with their corresponding rotation axes, between the intra-plate major and minor twinning variants shown in Fig. 3; for each misorientation angle ω, there is a family of eight equivalent rotations with eight corresponding equivalent axes d, which transform into each other according to the tetragonal rotation symmetry group.

	Variant pairs	Misorientation angle ω (°)	Rotation axis, **d**			
			d_1	d_2	d_3	
Intra-plate nanotwins	V_1/V_2	80.28	0.7040	0.7102	0.0077	0.51° from $\langle 110 \rangle_{Tetr}$
		179.68	0.5370	0.5441	0.6446	0.45° from the normal of $(112)_{Tetr}$
		179.43	0.4578	0.4538	0.7645	0.38° from $\langle 111 \rangle_{Tetr}$
	V_3/V_4	81.84	0.7112	0.7030	0.0010	0.34° from $\langle 110 \rangle_{Tetr}$
		179.56	0.5347	0.5339	0.6550	1.13° from the normal of $(112)_{Tetr}$
		179.93	0.4605	0.4658	0.7556	1.15° from $\langle 111 \rangle_{Tetr}$
Inter-plate major-major	V_1/V_3	83.64	0.6997	0.7123	0.0555	3.22° from $\langle 110 \rangle_{Tetr}$
		179.32	0.5532	0.5008	0.6657	2.90° from the normal of $(112)_{Tetr}$
		175.76	0.4669	0.4753	0.7458	2.01° from $\langle 111 \rangle_{Tetr}$
Inter-plate minor-minor	V_2/V_4	9.74	0.7566	0.0452	0.6523	11.55° from $\langle 301 \rangle_{Tetr}$ Or 2.63° from $\langle 201 \rangle_{Tetr}$
		175.11	0.7444	0.6660	0.0482	4.21° from the normal of $(110)_{Tetr}$
		179.56	0.0554	0.9964	0.0642	4.86° from $\langle 010 \rangle_{Tetr}$
Intra-plate nanotwins	V_5/V_6	82.87	0.7100	0.7042	0.0050	0.37° from $\langle 110 \rangle_{Tetr}$
		179.69	0.5325	0.5278	0.6618	1.66° from the normal of $(112)_{Tetr}$
		179.62	0.4660	0.4699	0.7497	1.65° from $\langle 111 \rangle_{Tetr}$
	V_7/V_8	81.47	0.7089	0.7053	0.0038	0.26° from $\langle 110 \rangle_{Tetr}$
		179.81	0.5375	0.5340	0.6526	0.96° from the normal of $(112)_{Tetr}$
		179.72	0.4602	0.4626	0.7577	0.95° from $\langle 111 \rangle_{Tetr}$

Inter-plate major-major	V_5/V_7	84.37	0.7017	0.7101	0.0575	3.31° from $\langle 110 \rangle_{Tetr}$
		179.54	0.5513	0.4966	0.6704	3.23° from the normal of $(112)_{Tetr}$
		175.57	0.4772	0.4716	0.7415	2.36° from $\langle 111 \rangle_{Tetr}$
Inter-plate minor-minor	V_6/V_8	8.53	0.7114	0.0779	0.6984	15.6° from $\langle 301 \rangle_{Tetr}$ Or 6.08° from $\langle 201 \rangle_{Tetr}$
		176.18	0.7423	0.6688	0.0415	3.81° from the normal of $(110)_{Tetr}$
		179.34	0.0519	0.9973	0.0529	4.25° from $\langle 010 \rangle_{Tetr}$

Table S2　The deformation gradient tensors M of the theoretically calculated martensite variants under the N-W relationship in the crystal coordinate system.

Variant type	Deformation gradient tensor, ε_{ij}		
V_1	0.9336	-0.0016	-0.0660
	-0.0016	0.9336	-0.0660
	0.0550	0.0550	1.1189
V_2	1.1189	0.0550	0.0550
	-0.0660	0.9336	-0.0016
	-0.0660	-0.0016	0.9336
V_3	1.1189	0.0550	-0.0550
	-0.0660	0.9336	0.0016
	0.0660	0.0016	0.9336
V_4	0.9336	0.0016	-0.0660
	0.0016	0.9336	0.0660
	0.0550	-0.0550	1.1189
V_5	1.1189	-0.0550	-0.0550
	0.0660	0.9336	-0.0016
	0.0660	-0.0016	0.9336
V_6	0.9336	-0.0660	0.0016
	0.0550	1.1189	-0.0550
	0.0016	0.0660	0.9336
V_7	0.9336	0.0016	0.0660
	0.0016	0.9336	-0.0660
	-0.0550	0.0550	1.1189
V_8	0.9336	0.0660	-0.0016
	-0.0550	1.1189	-0.0550
	-0.0016	0.0660	0.9336
V_9	1.1189	-0.0550	0.0550
	0.0660	0.9336	0.0016
	-0.0660	0.0016	0.9336
V_{10}	0.9336	-0.0016	0.0660
	-0.0016	0.9336	0.0660
	-0.0550	-0.0550	1.1189
V_{11}	0.9336	0.0660	0.0016
	-0.0550	1.1189	0.0550

	0.0016	-0.0660	0.9336
	0.9336	-0.0660	-0.0016
V_{12}	0.0550	1.1189	0.0550
	-0.0016	-0.0660	0.9336

Table S3   The deformation gradient tensors **M** of the theoretically calculated martensite variants under the K-S relationship in the crystal coordinate system.

Variant type	Deformation gradient tensor, ε_{ij}		
V_1	0.9310	0.0262	-0.1023
	-0.0285	0.9345	-0.0285
	0.0845	0.0262	1.1177
V_2	1.1177	0.0262	0.0845
	-0.0285	0.9345	-0.0285
	-0.1023	0.0262	0.9310
V_3	1.1177	0.0262	-0.0845
	-0.0285	0.9345	0.0285
	0.1023	-0.0262	0.9310
V_4	0.9310	-0.0262	-0.1023
	0.0285	0.9345	0.0285
	0.0845	-0.0262	1.1177
V_5	1.1177	-0.0262	-0.0845
	0.0285	0.9345	-0.0285
	0.1023	0.0262	0.9310
V_6	0.9310	-0.1023	-0.0262
	0.0845	1.1177	-0.0262
	0.0285	0.0285	0.9345
V_7	0.9310	-0.0262	0.1023
	0.0285	0.9345	-0.0285
	-0.0845	0.0262	1.1177
V_8	0.9310	0.1023	0.0262
	-0.0845	1.1177	-0.0262
	-0.0285	0.0285	0.9345
	0.9345	0.0285	-0.0285

V_9	-0.0262	0.9310	0.1023
	0.0262	-0.0845	1.1177
V_{10}	0.9310	0.0262	0.1023
	-0.0285	0.9345	0.0285
	-0.0845	-0.0262	1.1177
V_{11}	0.9345	0.0285	0.0285
	-0.0262	0.9310	-0.1023
	-0.0262	0.0845	1.1177
V_{12}	0.9345	-0.0285	-0.0285
	0.0262	1.1177	0.0845
	0.0262	-0.1023	0.9310
V_{13}	1.1177	0.0845	0.0262
	-0.1023	0.9310	0.0262
	-0.0285	-0.0285	0.9345
V_{14}	0.9345	0.0285	-0.0285
	-0.0262	1.1177	-0.0845
	0.0262	0.1023	0.9310
V_{15}	1.1177	0.0845	-0.0262
	-0.1023	0.9310	-0.0262
	0.0285	0.0285	0.9345
V_{16}	1.1177	-0.0845	0.0262
	0.1023	0.9310	-0.0262
	-0.0285	0.0285	0.9345
V_{17}	0.9345	0.0285	0.0285
	-0.0262	1.1177	0.0845
	-0.0262	-0.1023	0.9310
V_{18}	0.9345	-0.0285	0.0285
	0.0262	1.1177	-0.0845
	-0.0262	0.1023	0.9310
V_{19}	1.1177	-0.0845	-0.0262
	0.1023	0.9310	0.0262
	0.0285	-0.0285	0.9345
V_{20}	0.9345	-0.0285	0.0285
	0.0262	0.9310	0.1023
	-0.0262	-0.0845	1.1177

V_{21}	0.9310	0.1023	-0.0262
	-0.0845	1.1177	0.0262
	0.0285	-0.0285	0.9345
V_{22}	1.1177	-0.0262	0.0845
	0.0285	0.9345	0.0285
	-0.1023	-0.0262	0.9310
V_{23}	0.9345	-0.0285	-0.0285
	0.0262	0.9310	-0.1023
	0.0262	0.0845	1.1177
V_{24}	0.9310	-0.1023	0.0262
	0.0845	1.1177	0.0262
	-0.0285	-0.0285	0.9345

Table S4   The deformation gradient tensors M of the variant combination in Plate A and Plate B, as illustrated in Fig. 2, in the crystal coordinate system.

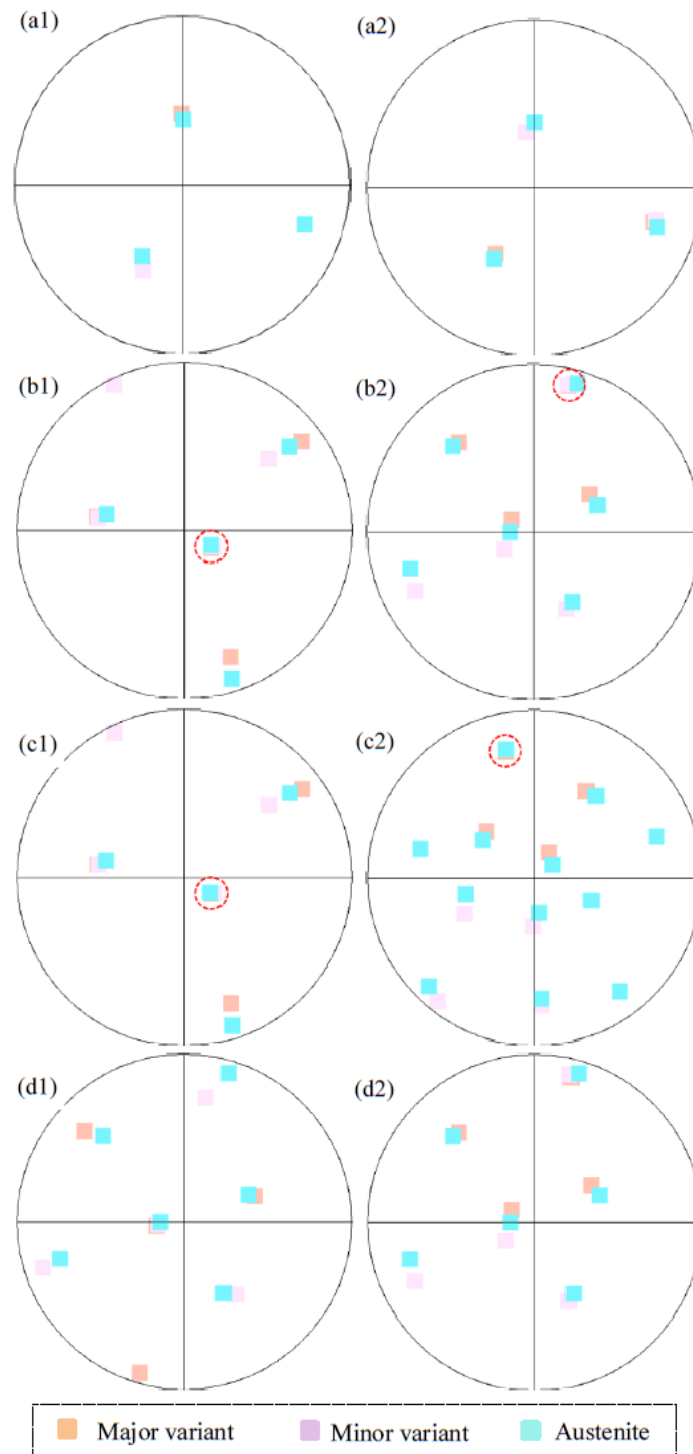| Variant pair	Deformation gradient tensor, ε_{ij}		
Plate A	1.0486	0.0038	0.0442
	0.0097	1.0024	-0.0088
	-0.0520	0.0117	0.9339
Plate B	0.9339	-0.0117	-0.0520
	0.0088	1.0024	-0.0097
	0.0442	-0.0038	1.0486

Figure S1. Demonstration of different possible orientation relationships between austenite and martensite, and corresponding pole figures. (a) Bain relation: $(001)_A//(001)_M$, $[100]_A//[1\text{-}10]_M$; (b) K-S relation: $(111)_A//(101)_M$, $[1\text{-}10]_A//[11\text{-}1]_M$; (c) N-W relation: $(111)_A//(101)_M$, $[\text{-}211]_A//[10\text{-}1]_M$; (d) Pitsch relation: $(110)_A//(1\text{-}1\text{-}2)_M$, $[1\text{-}10]_A//[\text{-}11\text{-}1]_M$. The common poles are enclosed with open circles. It indicates that during the martensitic transformation the major variant agrees well with the N-W relationship and the minor variant agrees with the K-S relationship.