

# **Fundamental Investigations of the Deformation Behavior of Single-Crystal Ni-Mn-Ga Alloys and Their Polymer Composites via the Introduction of Various Fields**

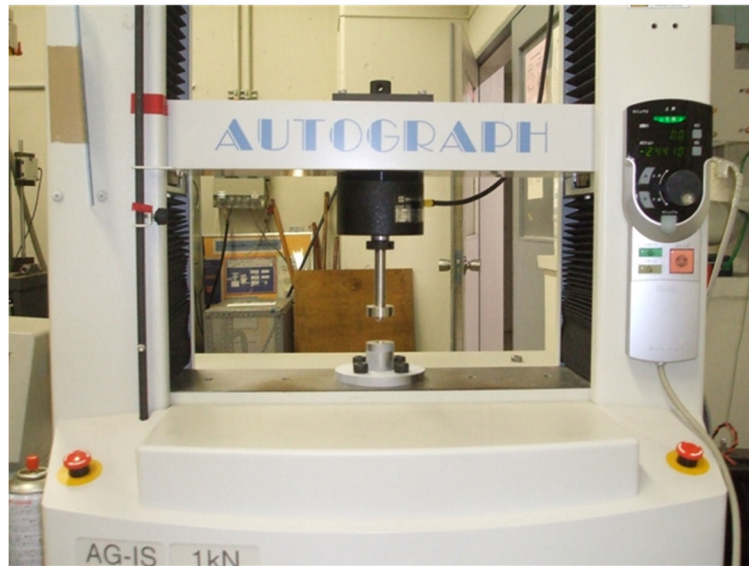
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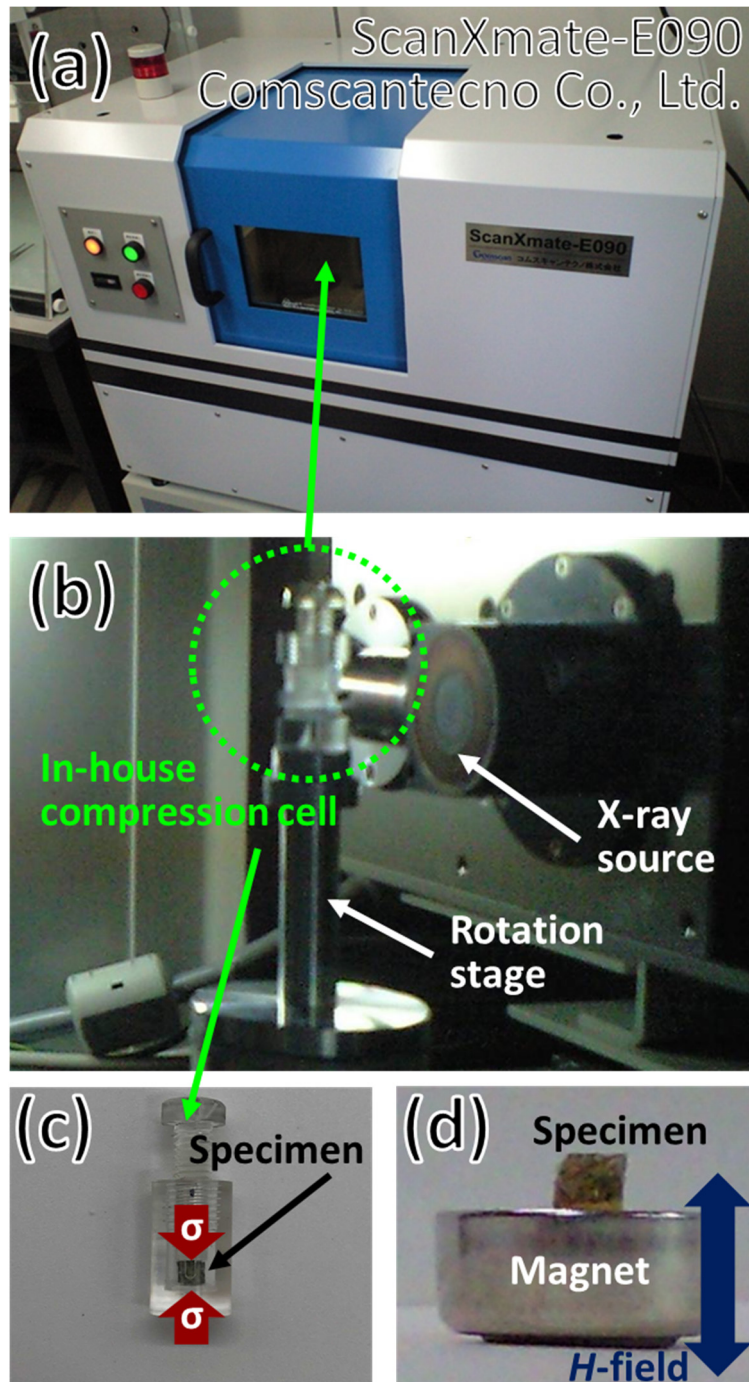
**(a) Universal testing machine**



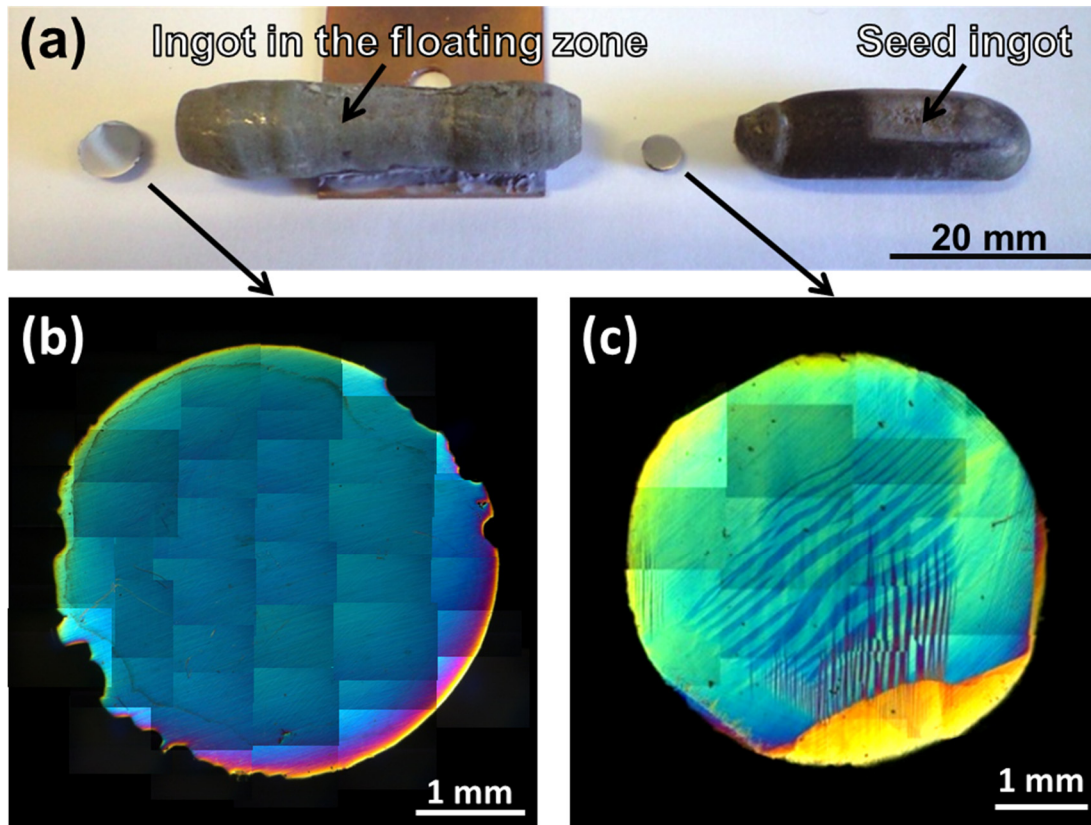
**(b) Jig for compression test**



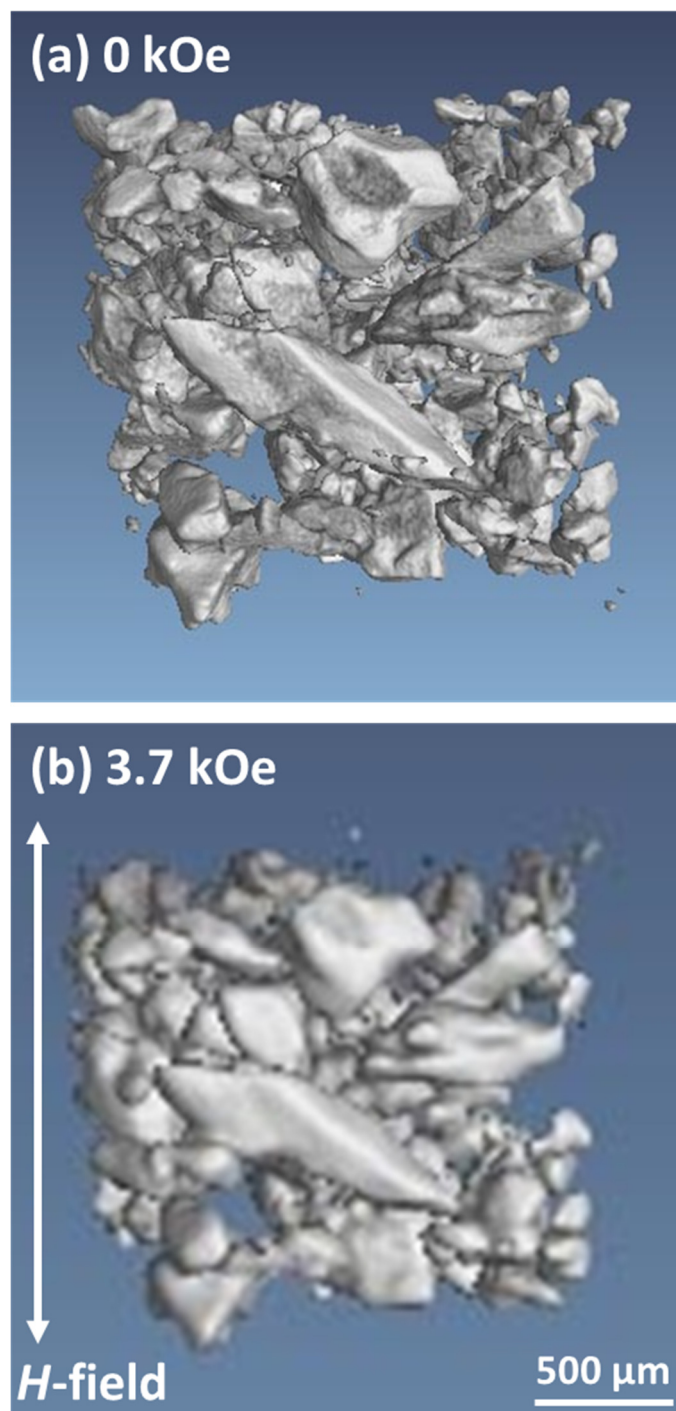
**Figure S1** Photos of (a) the universal testing machine and (b) the zoomed-in jig regime for conducting compression tests.



**Figure S2** (a) The main chamber of the  $\mu$ CT, (b) setting of the in-house compression on the rotation stage in the main chamber, (c) setting of the specimen in the in-house compression cell, and (d) setting of the specimen on the magnet.



**Figure S3** (a) SC Ni-Mn-Ga ingot prepared by a floating zone method and (b, c) the corresponding OM images of the plates sliced down from different places of the ingot.



**Figure S4** The  $\mu$ CT images of the 10 vol.% SC Ni-Mn-Ga particles/silicone composite (a) before and (b) after the introduction of the 3.7 kOe magnetic field by using a magnet.

**Table S1** Comparison of the Ni-Mn-Ga alloys composed composites.

Specimen	Apparent phase	Applied field	Deformation strain	Others	Ref.
SC Ni-Mn-Ga cube/silicone	5M martensite	Magnetic field	~4% (macro)	•30 vol.% particles	[35]
SC Ni-Mn-Ga cube/silicone	5M martensite (major) + 7M martensite (minor)	Compression	~3.5% (5M martensite) ~5.5% (7M martensite) (micro strains)	•20 vol.% particles	[38]
SC Ni-Mn-Ga cube/silicone	5M martensite	Magnetic field	--	•7 vol.% cube •13 vol.% cube •23 vol.% cube	[39]
SC Ni-Mn-Ga cube/silicone	5M martensite (major) + 7M martensite (minor)	Magnetic field	~4% (macro)	•20 vol.% particles	[41]
SC Ni-Mn-Ga cube/silicone	7M martensite	Magnetic field	--	•Opened surface one-cube (10 vol.% Ni-Mn-Ga alloy)	[46]
SC Ni-Mn-Ga cube(s)/epoxy	5M martensite	Compression/ Magnetic field	~3.6% (by $\sigma$ -field) ~0.26% (by $H$ -field)	•One-cube (30 vol.% Ni-Mn-Ga alloy) •One-cube (30 vol.% Ni-Mn-Ga alloy) •Two-cube (20 vol.% Ni-Mn-Ga alloy)	[47]
SC Ni-Mn-Ga cube(s)/silicone	5M martensite	Compression/ Magnetic field	2%~3% (by $\sigma$ -field)	•Two-cube (25 vol.% Ni-Mn-Ga alloy) •Two-plate (50 vol.% Ni-Mn-Ga alloy)	[47]
SC Ni-Mn-Ga particles/Cu foil	5M martensite	Magnetic field	2.7% (micro) ~3% (macro)	Sandwich structure (layered composite)	[48]
SC Ni-Mn-Ga particles/epoxy	5M martensite	Compression/ Magnetic field	2%	•One-particle •10 vol.% particles •40 vol.% particles	This study
SC Ni-Mn-Ga alloys/silicone	5M martensite	Compression/ Magnetic field	--	•10 vol.% particles •20 vol.% particles •40 vol.% particles	This study