

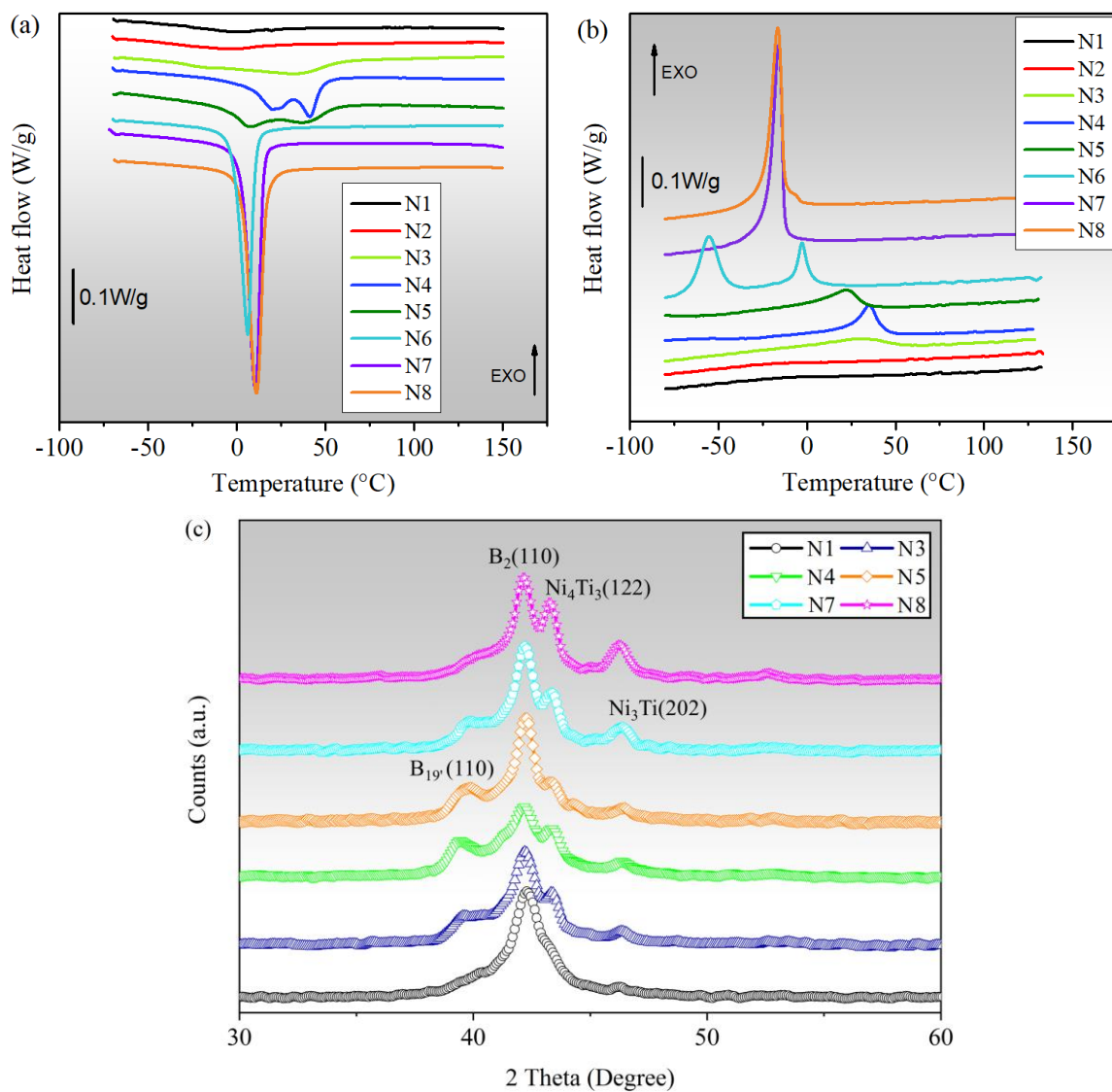
# Enhancement of fracture toughness of NiTi alloy by controlling grain size gradient

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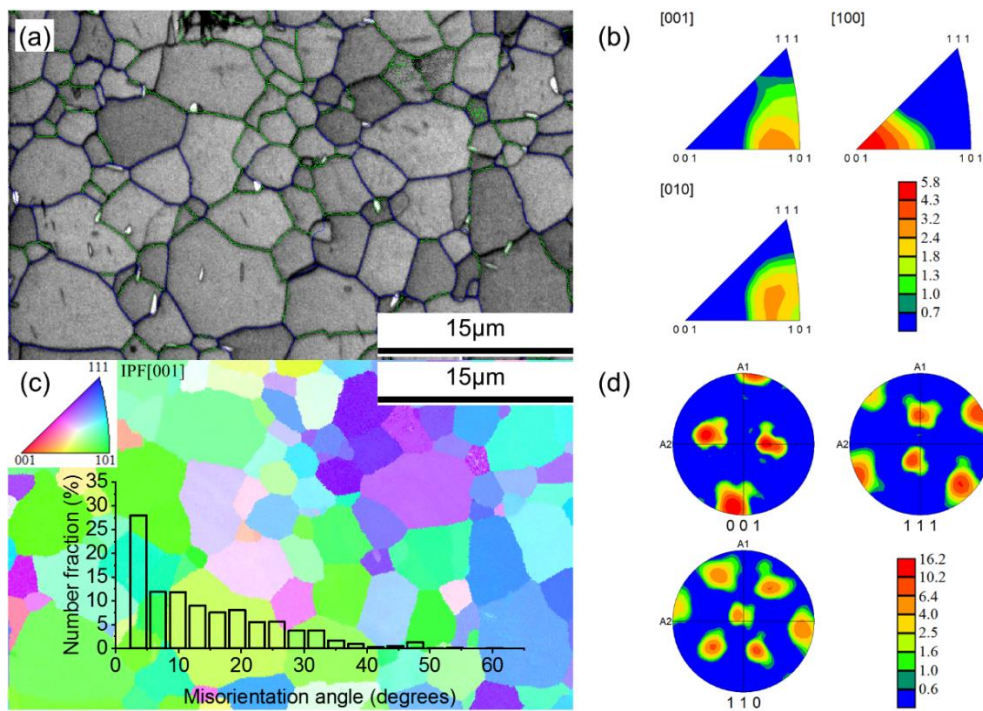
## Supplementary material



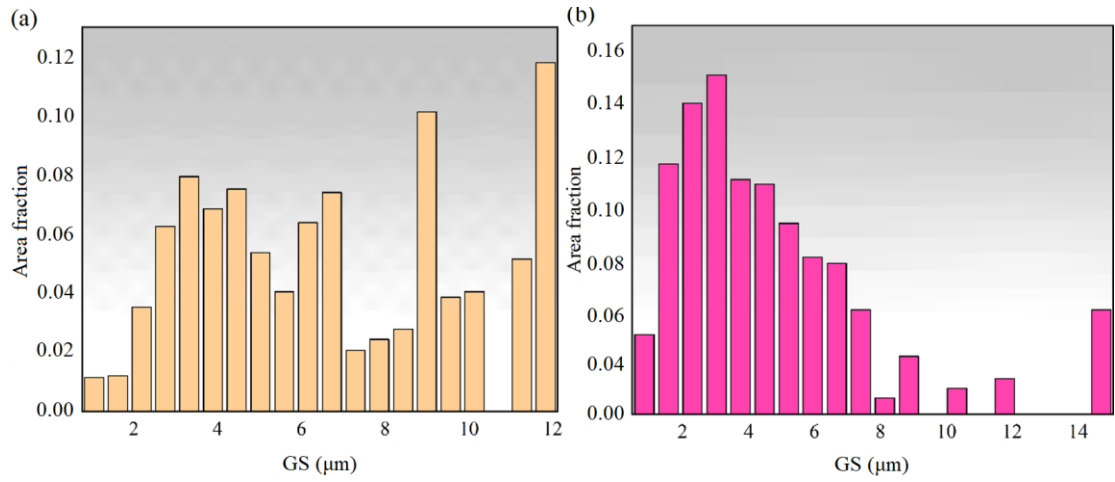
**Figure S1.** Thermodynamic properties and phase characterization of the samples with normal GS distributions: (a) Differential scanning calorimetry (DSC) curves of heating process; (b) DSC curves of cooling process; (c) X-ray diffraction results.

1 **Table S1.** Statistics of phase transition temperatures of typical samples

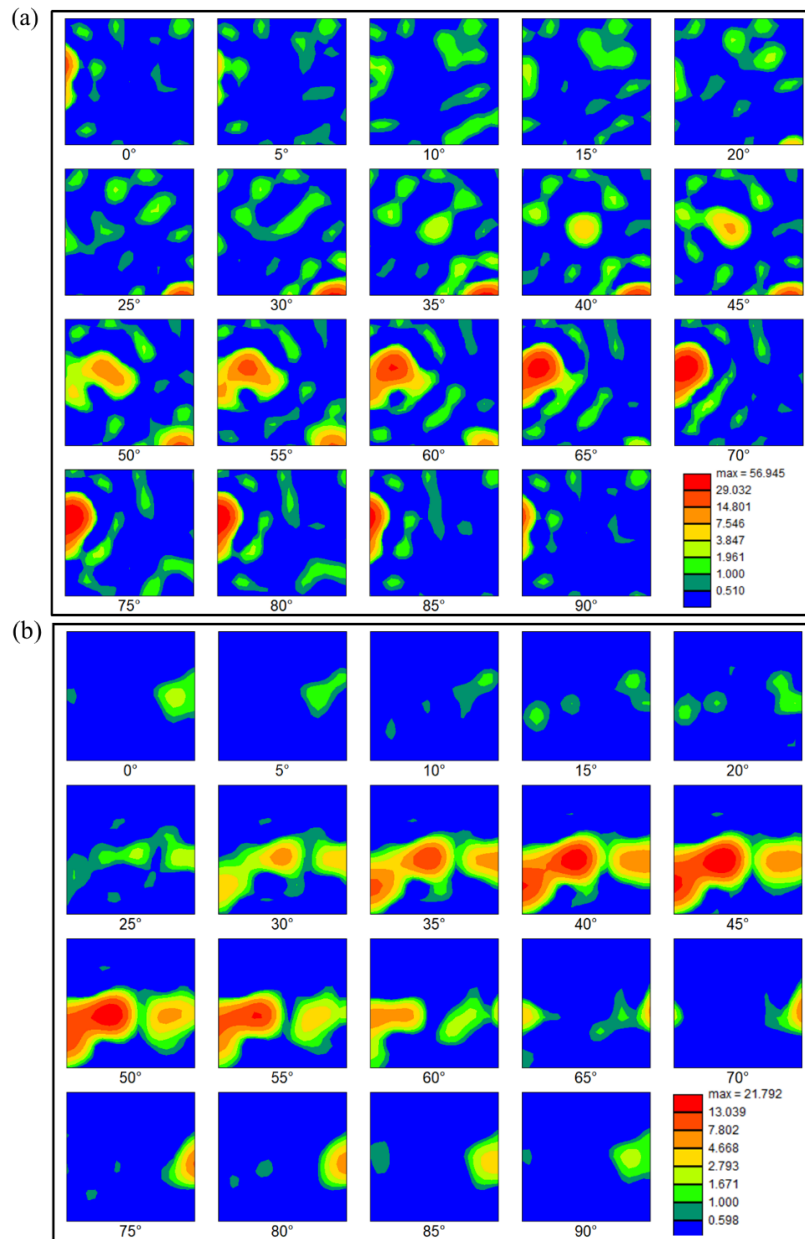
Category	Sample	$A_s$ (°C)	$A_f$ (°C)	$M_s$ (°C)	$M_f$ (°C)
Normal distribution	N1	—	—	—	—
	N2	—	—	—	—
	N3	—	56.8	51.4	—
	N4	7.9	48.4	44.0	22.0
	N5	-4.0	56.3	33.4	9.4
	N6	-4.5	12.6	3.5	-68.1
	N7	0.5	16.5	-11.0	-27.5
	N8	-1.4	18.0	-6.5	-27.0
Locally high gradient distribution	HG1	-6.1	10.3	-12.0	-56.1
	HG2	2.0	12.5	-15.5	-27.5



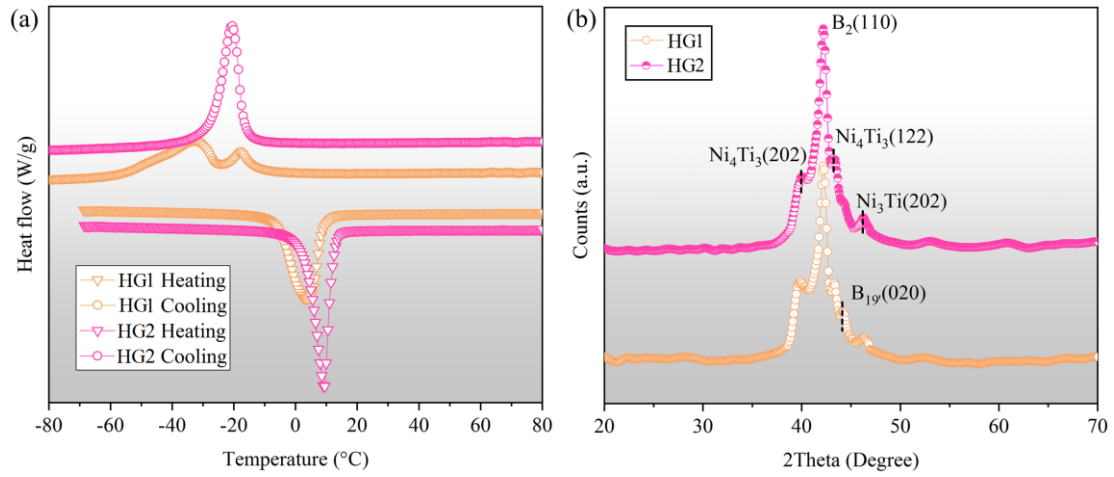
4 **Figure S2.** Microstructure characterization of sample HG1: (a) SEM morphology; (b) The  
5 corresponding inverse pole figure (IPF); (c) IPF maps and statistics of grain boundaries  
6 misorientation angles; (d) The corresponding pole figure (PF).  
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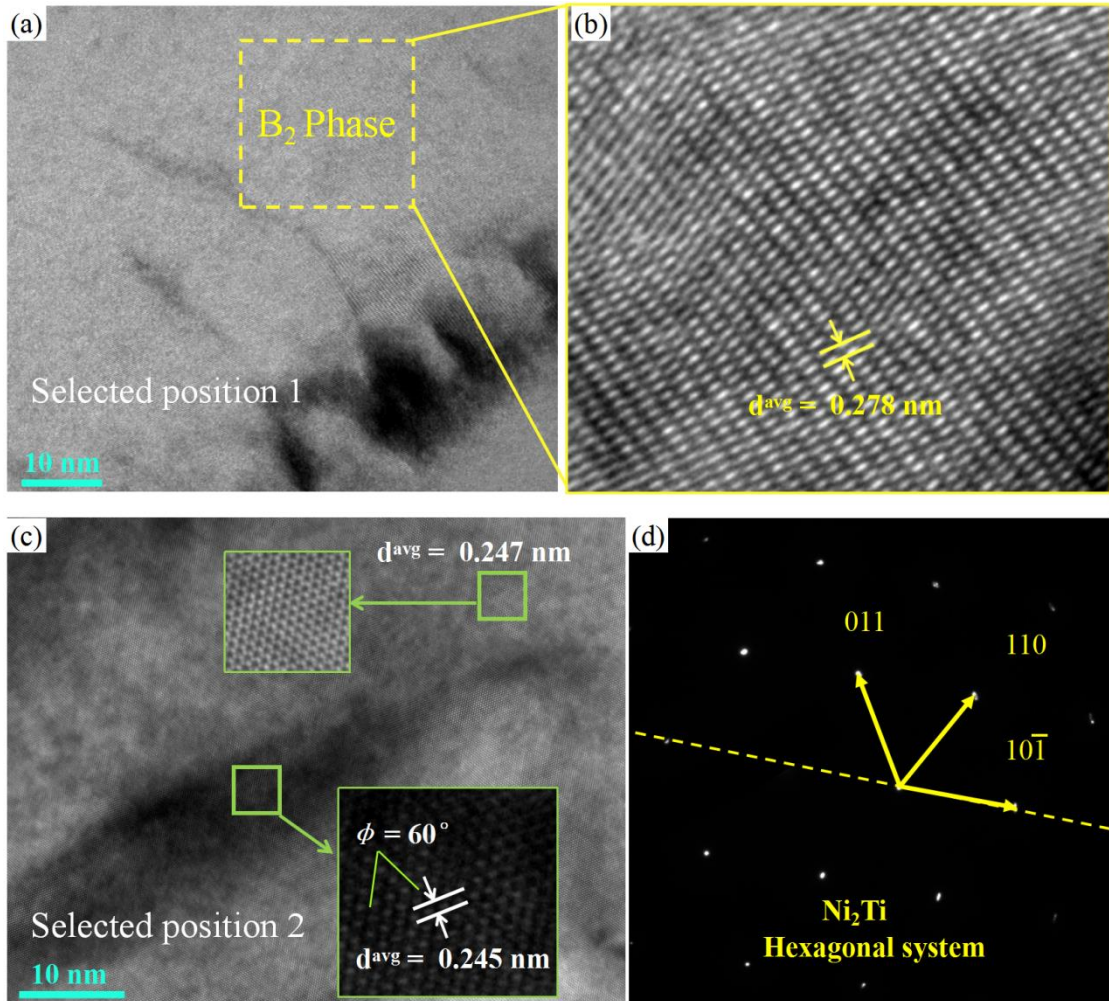
**Figure S3.** Grain size (GS) statistical results: (a) sample HG1 and (b) sample HG2.



**Figure S4.** The orientation distribution function (ODF) maps: (a) sample HG1, (b) sample HG2.



**Figure S5.** Thermal performance and phase characterization of samples HG1 and HG2: (a) DSC results. (b) XRD results.



**Figure S6.** TEM characterization results of two selected positions of region 1 in Figure 7. Selected position 1 represents the typical structure in the coarse-grained matrix: (a) Austenite B<sub>2</sub> structure with interface of nano subgrains and boundaries; (b) The corresponding lattice stripes. Selected position 2 represents Ni<sub>2</sub>Ti structures: (c) Bright field image and lattice stripes of the precipitation phase. The areas with darker contrast are the Ni<sub>2</sub>Ti precipitates with larger distortion; (d) The corresponding selected area electron diffraction pattern show a typical hexagonal system of Ni<sub>2</sub>Ti precipitate.