Supporting Information

Microstructural Gradational Properties of Sn-Doped Gallium Oxide Heteroepitaxial Layers Grown Using Mist Chemical Vapor Deposition

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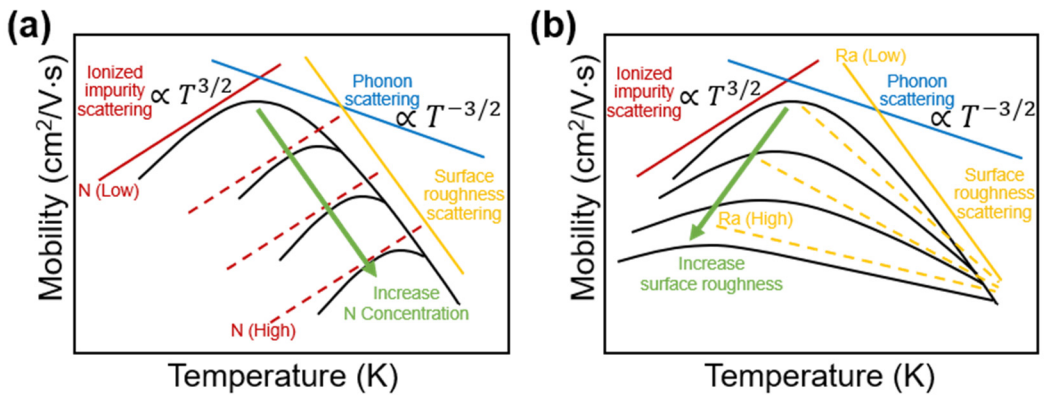
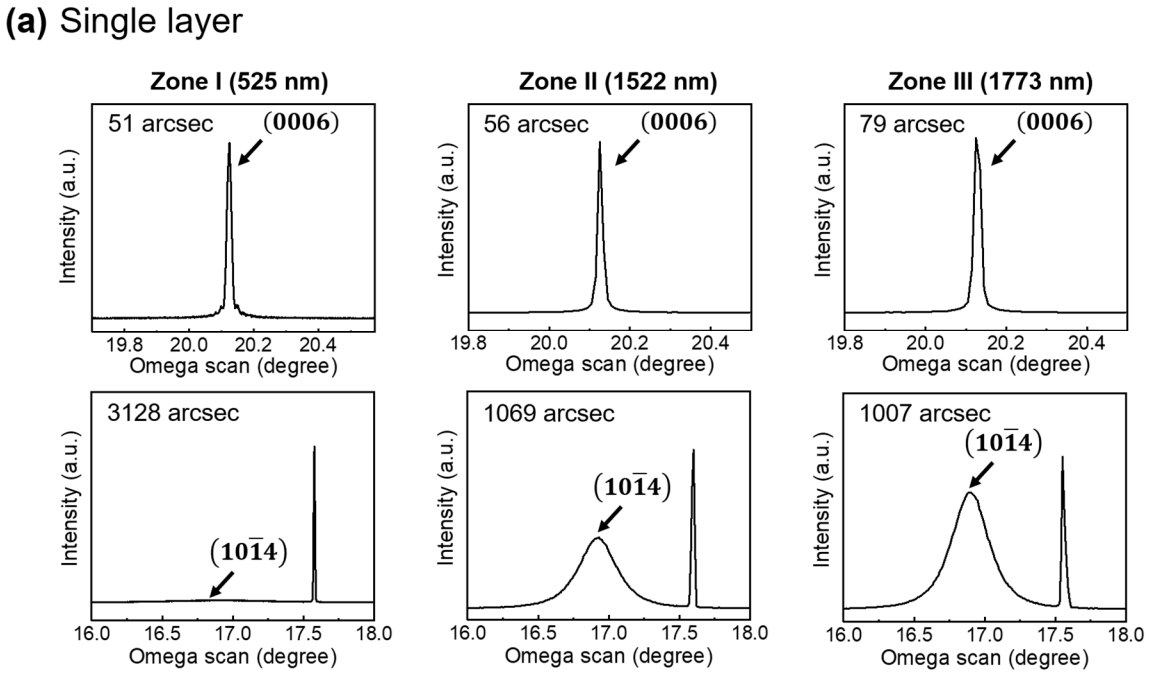


Figure S1. Schematic description of the temperature-dependent carrier mobility of the grown layers under effects of various scattering mechanisms: (a) variation in impurity concentration and (b) variation in surface roughness. Note that the peak shifts to high temperature and peak shifts to low temperature with increasing N concentration and surface roughness, respectively [1,2].



(b) Double layers

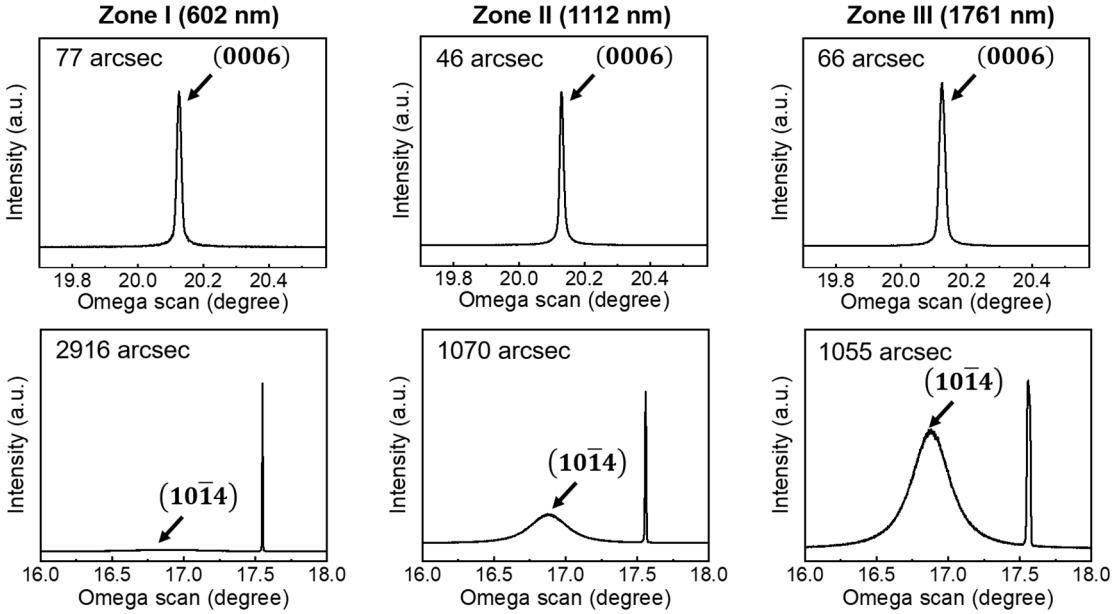


Figure S2. (0006) and (10$\bar{1}$4) plane omega-scan XRD patterns and FWHM for (a) single Ga_2O_3 layer and (b) double Ga_2O_3 layers with various thicknesses.

Table S1. Hall measurement data of the temperature-dependent carrier mobility and carrier concentration for (a) single Ga_2O_3 layer and (b) double Ga_2O_3 layers.

	Single layer					
	mobility ($cm^2/V{\cdot}s$)			carrier concentration ($\times 10^{18}$ cm^{-3})		
Temp. (K)	A	B	C	A	B	C
80	4.0	2.4	3.3	1.3	1.8	9.4
90	4.4	2.8	3.6	1.3	1.8	9.2
100	4.4	3.0	3.7	1.3	1.8	12.0
110	4.4	3.1	3.8	1.3	1.7	10.3
120	4.4	3.2	3.9	1.3	1.7	9.6
130	4.3	3.3	4.0	1.3	1.7	9.0
140	4.4	3.5	4.2	1.4	1.6	8.8
150	4.5	3.6	4.4	1.3	1.6	8.9
160	4.6	3.7	4.4	1.4	1.6	8.8
170	4.6	3.8	4.6	1.4	1.6	8.3
180	4.6	3.9	4.9	1.4	1.6	8.1
190	4.8	4.0	5.1	1.4	1.7	8.3
200	5.0	4.1	5.2	1.4	1.7	8.7
210	4.9	4.1	5.5	1.5	1.7	9.2
220	4.6	4.2	5.4	1.5	1.7	8.6
230	4.6	4.3	5.5	1.5	1.7	8.6
240	4.7	4.3	5.7	1.6	1.8	9.5
250	4.6	4.3	5.8	1.6	1.8	9.0
260	4.3	4.2	5.8	1.6	1.9	8.6
270	4.1	4.1	6.2	1.6	2.0	8.5
280	4.4	4.1	5.9	1.6	2.0	8.3
290	4.3	4.0	6.3	1.6	2.2	8.4
300.	4.2	3.9	6.3	1.5	2.5	9.6

(b)

	Double layers					
	mobility ($cm^2/V \cdot s$)			carrier concentration ($\times 10^{18}$ cm^{-3})		
Temp. (K)	A	B	C	A	B	C
80	2.4	2.1	2.2	5.4	1.8	1.2
90	2.4	2.1	2.3	5.1	1.8	1.3
100	2.4	2.1	2.5	5.5	1.9	1.4
110	2.9	2.3	2.5	5.0	1.7	1.3
120	2.9	2.3	2.6	5.1	1.7	1.3
130	2.9	2.2	2.8	5.0	1.8	1.3
140	3.0	2.4	2.8	5.1	1.6	1.3
150	2.9	2.3	2.9	5.0	1.7	1.4
160	3.0	2.5	2.7	4.8	1.7	1.4
170	3.1	2.6	2.8	4.7	1.6	1.4
180	3.1	2.7	2.8	4.8	1.6	1.3
190	3.0	2.7	2.7	5.1	1.6	1.4
200	3.2	2.8	2.8	4.8	1.6	1.3
210	3.3	3.0	2.8	4.7	1.5	1.3
220	3.2	3.0	2.9	4.6	1.5	1.3
230	3.2	3.1	2.9	5.0	1.5	1.2
240	3.2	3.0	3.0	4.6	1.6	1.2
250	3.3	3.1	3.1	4.6	1.5	1.2
260	3.2	3.0	3.2	4.6	1.6	1.3
270	3.2	3.0	3.2	4.4	1.6	1.3
280	3.0	3.1	3.1	5.1	1.5	1.3
290	3.2	3.1	3.2	5.1	1.6	1.3
300	3.1	3.3	3.2	5.0	1.5	1.4

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