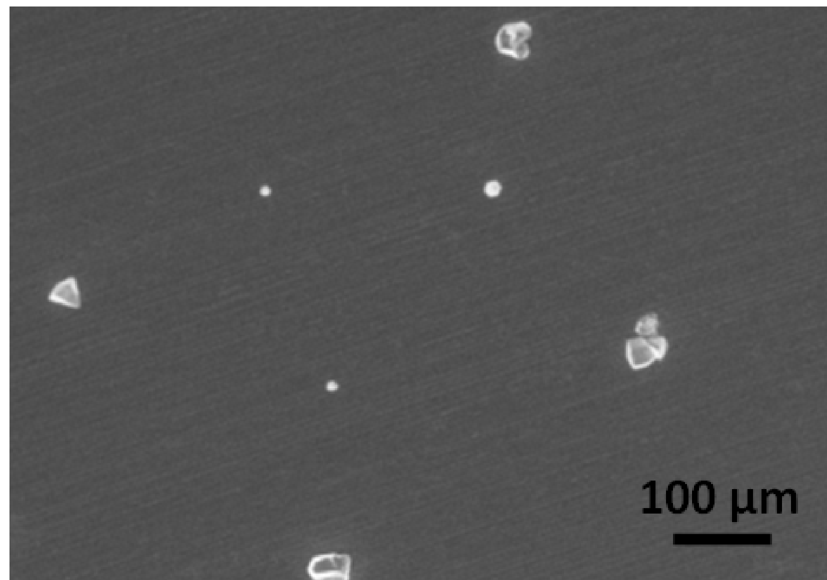
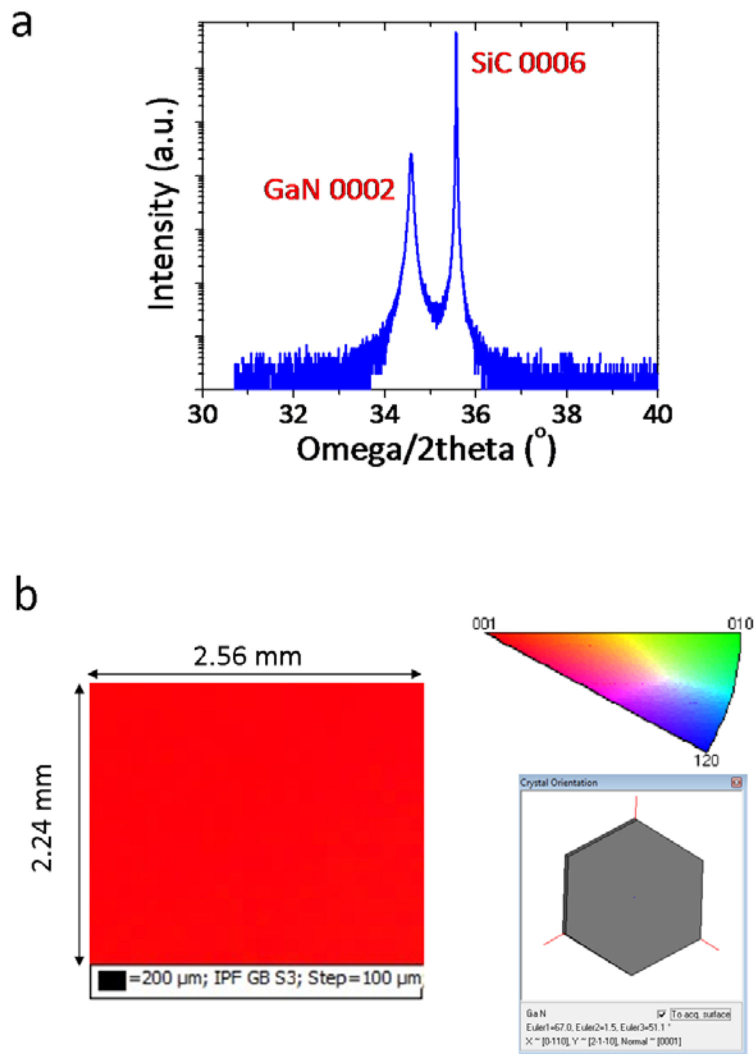
Supplementary Information

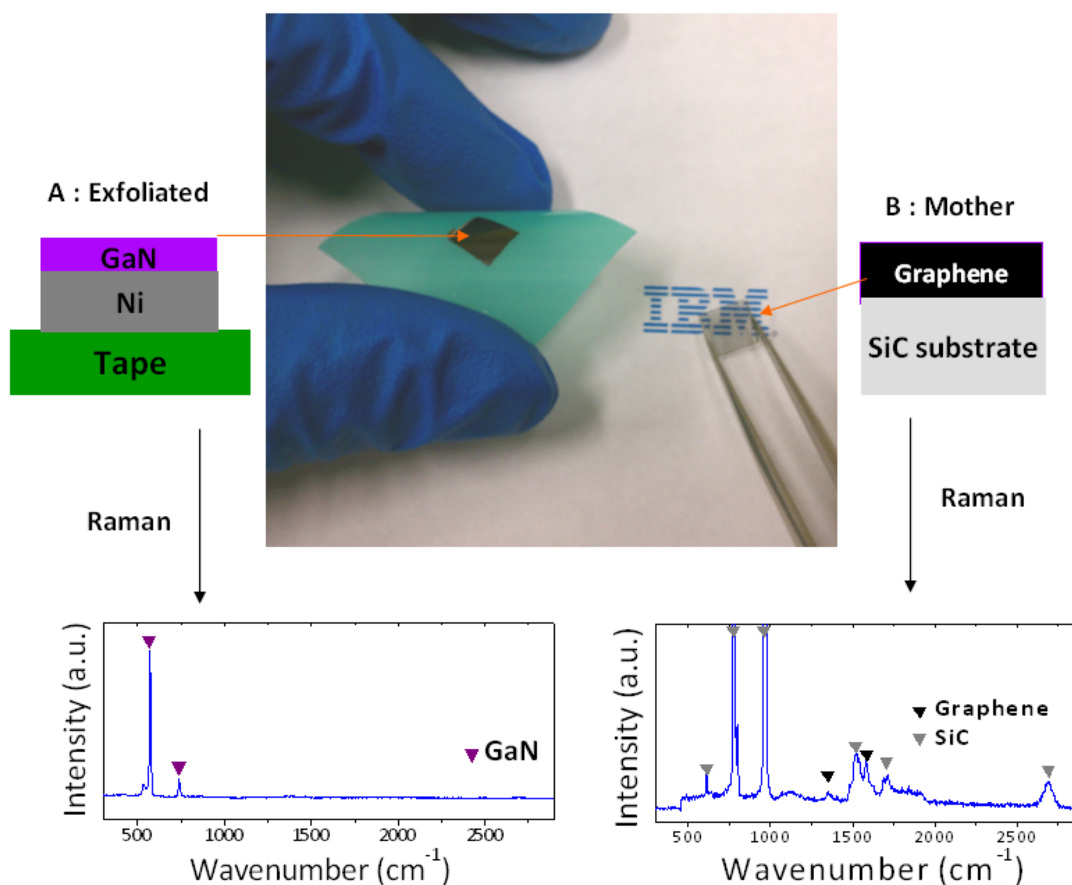


Supplementary Figure 1 | Plan-view SEM image of the GaN sample grown at 1250°C for 1 hour.

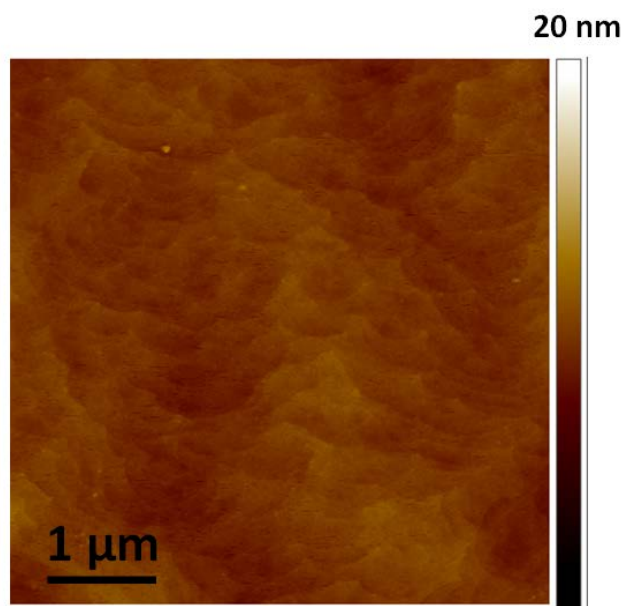
Supplementary Figure 2 | Diffraction patterns taken at a GaN/graphene/SiC interface



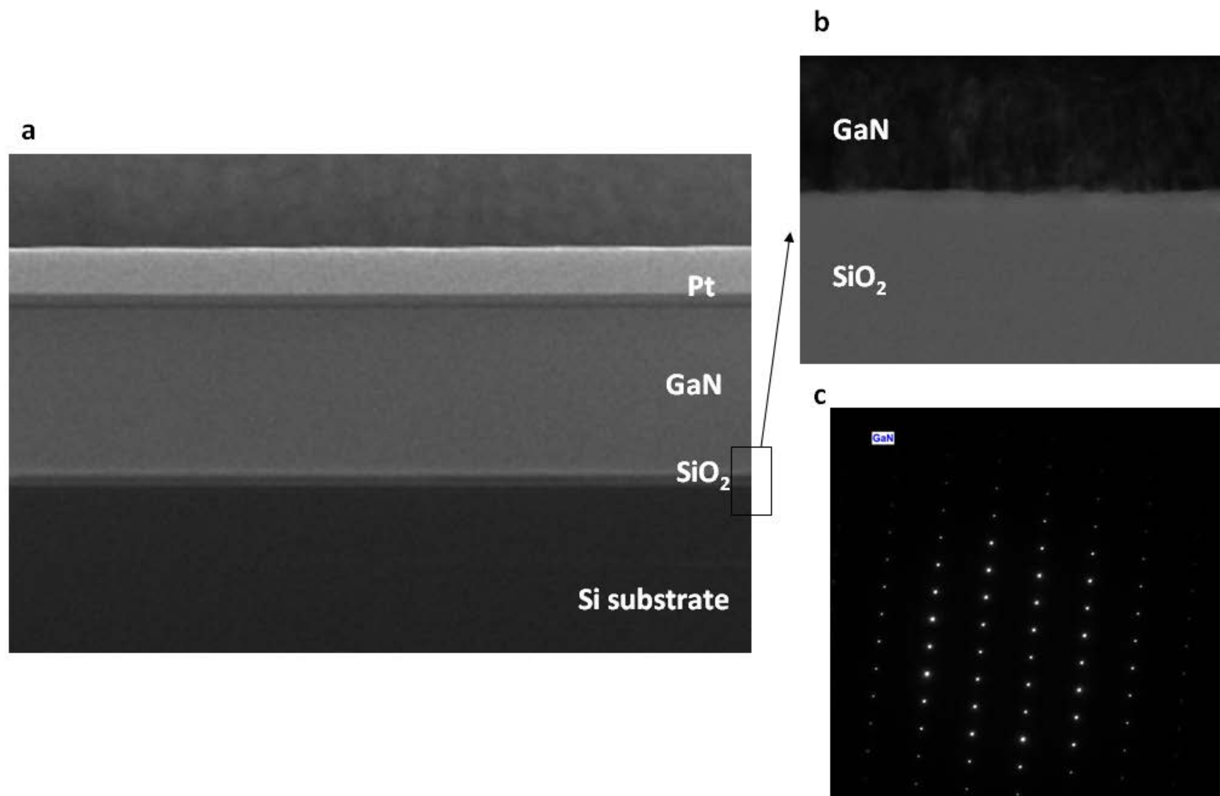
Supplementary Figure 3 | Single-crystallinity of GaN on epitaxial graphene. (**a**) Typical HRXRD omega/2theta scan spectra on GaN films grown on epitaxial graphene. The same spectra were recorded across the sample, and (**b**) electron backscatter diffraction (EBSD) map on GaN films grown on epitaxial graphene. The same mapping images were recorded across the sample.



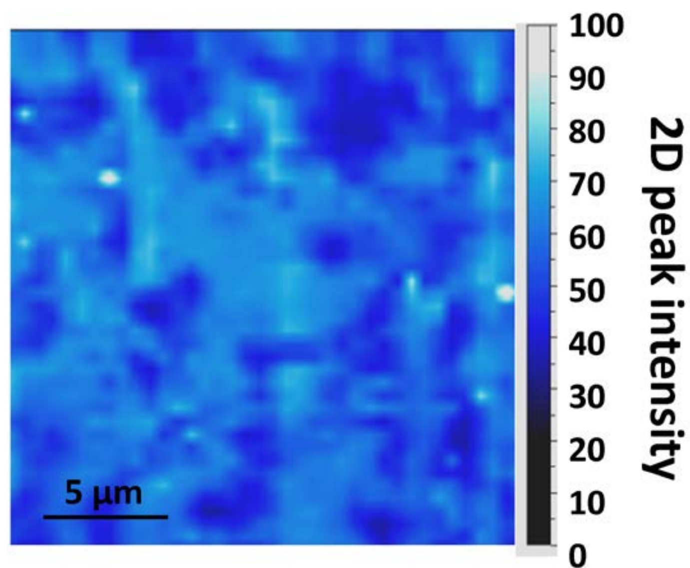
Supplementary Figure 4 | Transferred GaN on a flexible tape. The photographs show the exfoliated GaN epilayers/Ni on tape (A) and mother graphitized SiC substrate (B). As indicated by Raman spectra taken from A and B, the entire GaN film was exfoliated from the mother substrate by leaving graphene on the SiC surface.



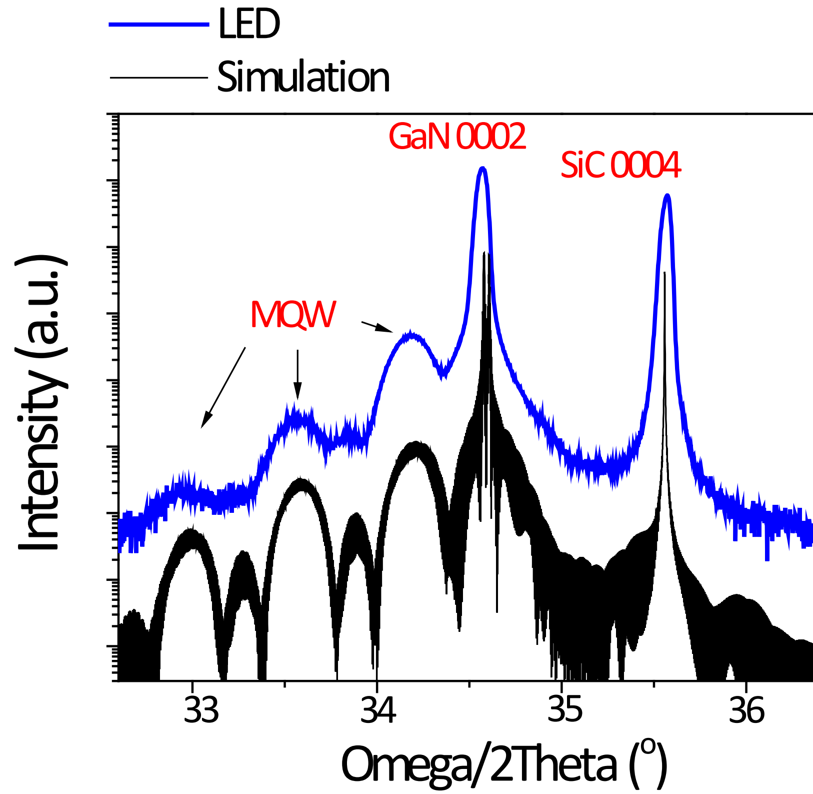
Supplementary Figure 5 | AFM topology of the released surface of GaN films. The RMS roughness of the released GaN surface was 5 Å.



Supplementary Figure 6 | GaN on insulator structure observed by (a) XSEM after FIB, (b) XTEM, and (c) Selective area electron diffraction patterns of GaN.



Supplementary Figure 7 | Graphene coverage on a SiC substrate after GaN release. The map of the graphene 2D peak intensity from Raman spectra taken on the surface of remaining substrate after GaN release shows full coverage of graphene on SiC.



Supplementary Figure 8 | HRXRD/simulation data from the InGaN/GaN LED heterostructure grown on a reused graphene/SiC substrate

Supplementary Table 1 | Comparison of crystalline quality of GaN/graphene to that of GaN/other substrates. Comparison results suggest that graphene/SiC offers a desirable platform for GaN materials.

Material	Substrate	Epitaxial Mismatch (%)	Threading Dislocation Density (cm^{-2})	AFM RMS Roughness (Å)	XRD (0002) 2θ/ω Scan		Ref.
					2θ Peak (°)	FWHM (arcsec)	
GaN	GaN	0	3×10^{6}	1.18	34.86	90	1,2
GaN	Al_2O_3	14	9×10^{8}	1.74	34.54	220	3,4
GaN/AlN	Al_2O_3	14	6×10^{8}	2.14	34.22	380	5
GaN/AlN	Si (111)	17	3×10^{9}	> 6.0	34.56	380	5,6
GaN/AlN	SiC	3	2×10^{9}	1.80	34.55	200	7
GaN	**Graphene/SiC**	**23**	**1×10^{9}**	**2.98**	**34.57**	**222**	**This work**

Supplementary References:

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2. www.kymatech.com; (see Bulk GaN Substrates specifications)

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