

Supporting Information

One-Step Laser Patterned Highly Uniform Reduced Graphene Oxide Thin Films for Circuit-enabled Tattoo and Flexible Humidity Sensor Application

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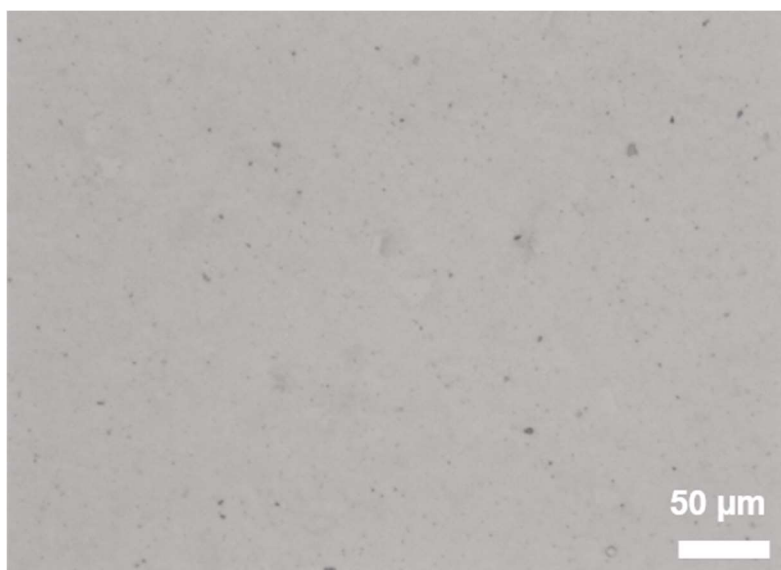


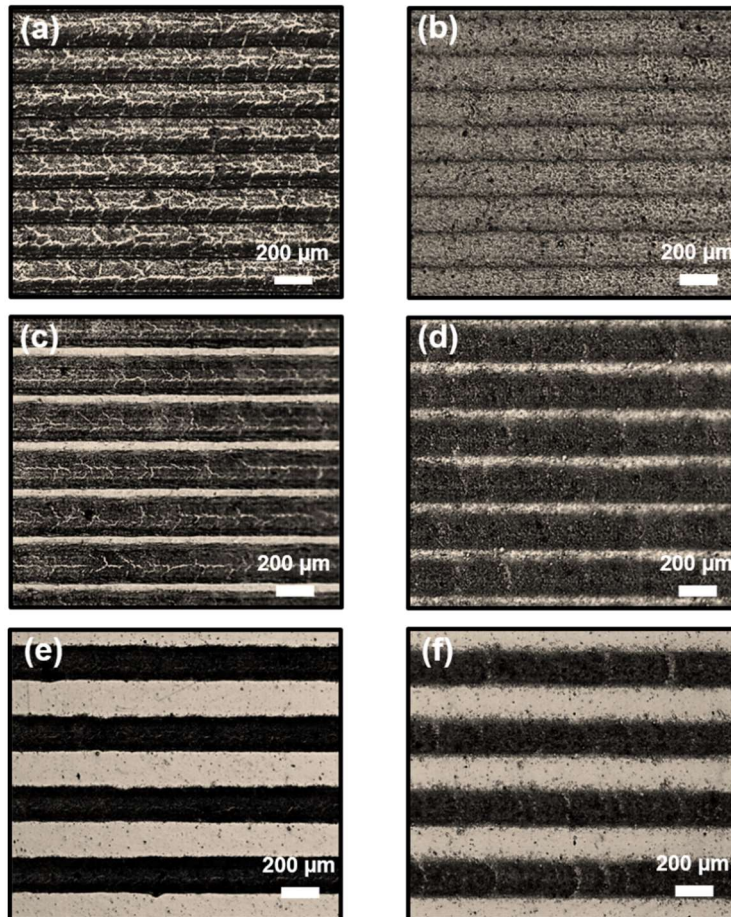
Figure S1. OM image of highly uniform GO thin film (~40 nm) on APTES-treated PP substrate produced by FESA process.

Parameter	Value
Source	Nd:YVO4 UV pulsed laser
Wavelength (nm)	355
Average power (W)	0.8
Pulse length (ns)	20
Repetition rate (kHz)	30
Beam diameter (mm)	1.5
Beam divergence (mrad)	< 0.5
Beam Mode (m ²)	< 1.25 TEM ₀₀

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Figure S2. Specification of laser system.



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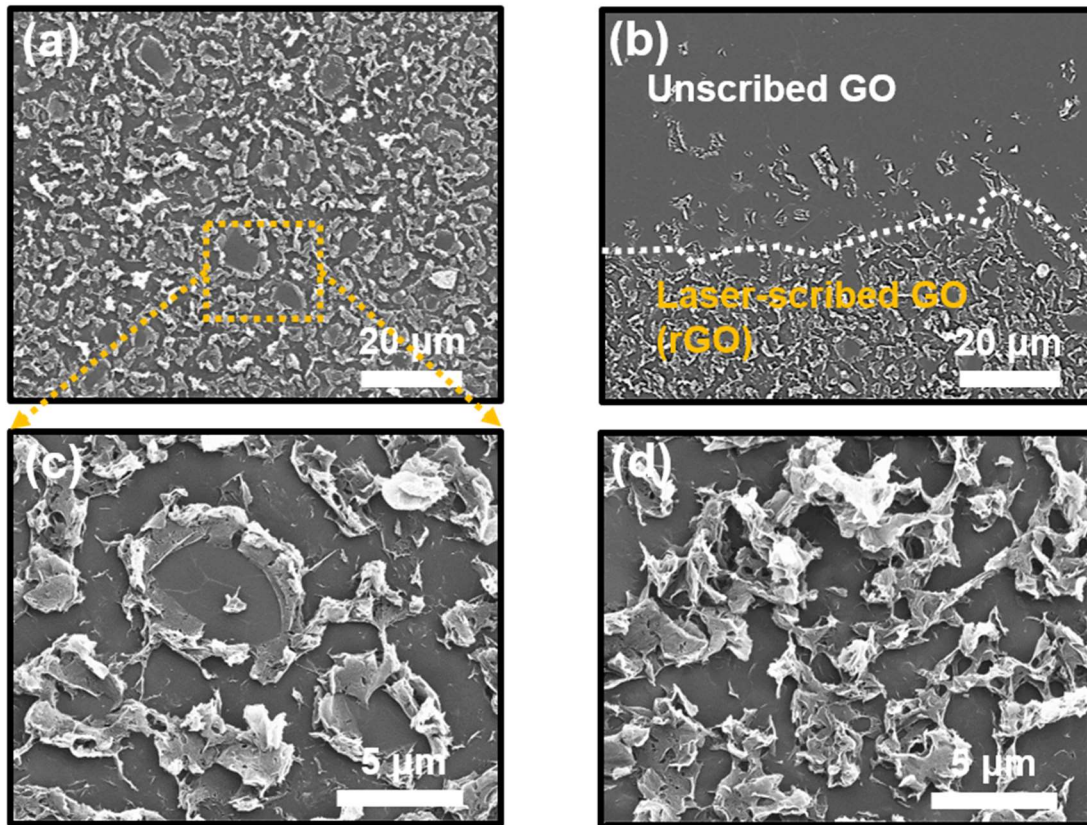
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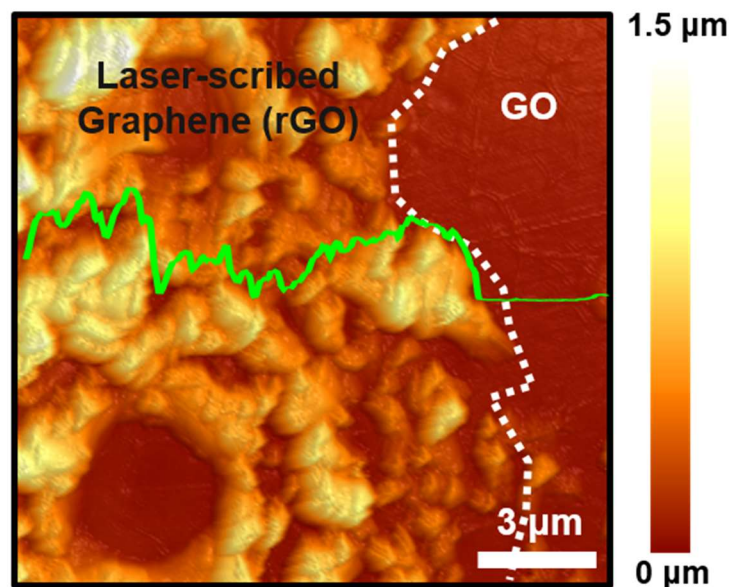
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Figure S3. OM images of the stripe-patterned rGO with the line width of $\sim 180 \mu\text{m}$ by direct (left side) and indirect laser exposure (right side) under the condition of laser power 0.8 W and laser speed 100 mm/s; (a), (b): patterns of overlapping lines, (c), (d): line intervals of $\sim 50 \mu\text{m}$ and (e), (f): line intervals of $\sim 200 \mu\text{m}$.



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27 **Figure S4.** SEM images revealing the surface morphology of rGO film by indirect laser exposure
 28 through the PP barrier under the condition of laser power 0.8 W and laser speed 100 mm/s. (a) GO
 29 surface inside the indirectly laser-exposed region. (b) The boundary between laser exposed rGO
 30 region and unscribed region in GO thin film marked by the white dotted line. (c) and (d) highly
 31 magnified SEM images of rGO surface with surface craters and swollen structures formed by PP
 32 barrier at laser exposure.



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34 **Figure S5.** Representative AFM image of the noticeable interface differences between the laser-scribed
 35 GO region and unscribed GO region; Green line shows relative height profile (up to $\sim 1.5 \mu\text{m}$) to the
 36 left and right area, bounding the white dotted line.

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