

Supporting Information

Water-based 2-Dimensional Anatase TiO₂ Inks for Printed Diodes and Transistors

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S1. Ink characterization

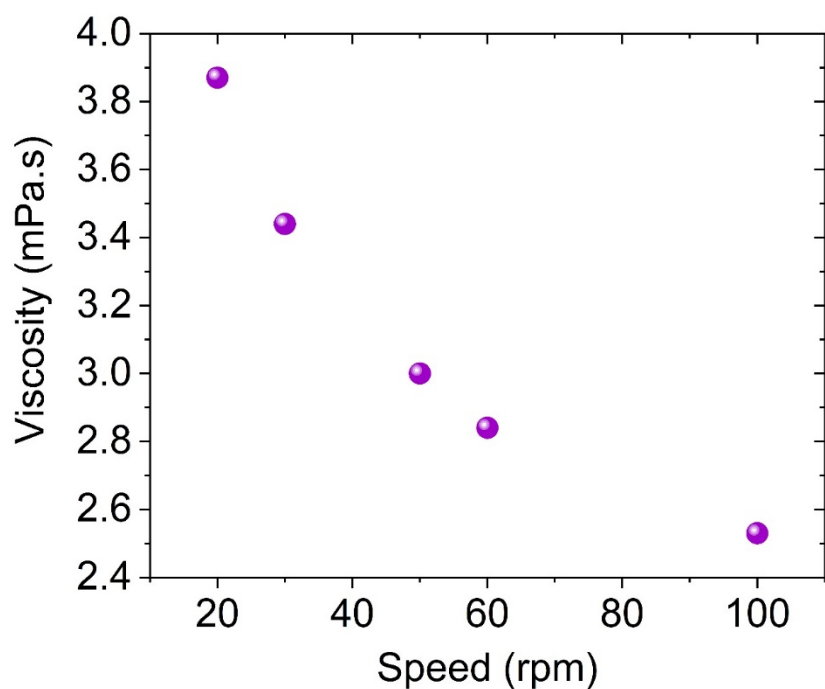


Figure S1. The dynamic viscosity of the TiO₂ ink versus the rotational speed of the viscometer probe at ambient temperature

Table S1. Optimized inkjet printing parameters of TiO₂-NS ink

Parameters	Values
Firing voltage [V]	17 ± 2V
Jetting frequency [kHz]	5
Cartridge temperature [°C]	Ambient (≈ 23)
Drop spacing [μm]	30 (Glass - Paper) 35 (Si/SiO ₂)
Meniscus pressure [inches H ₂ O]	4
Platen temperature [°C]	45

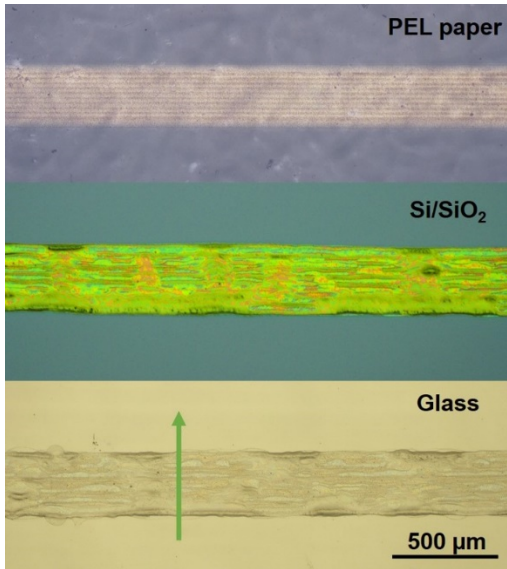


Figure S2. Optical micrographs showing inkjet-printed TiO₂ lines on paper, silicon and glass substrates. The green arrow indicates the profilometry scan direction.

S2. Capacitor characterization

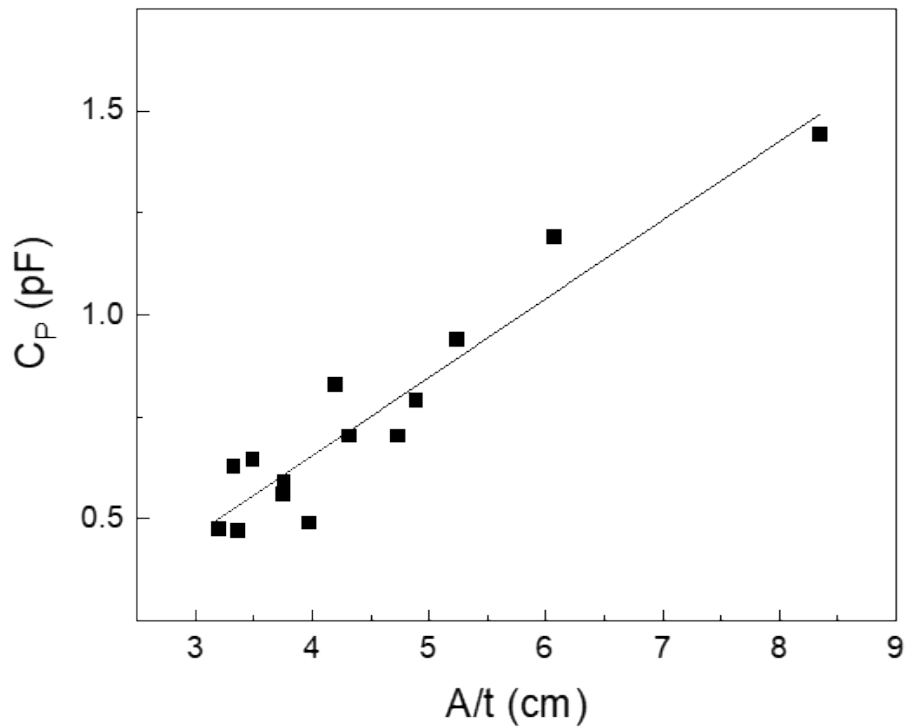


Figure S3. Capacitance values measured at 1 KHz plotted as a function of the area to thickness (A/t) ratio for inkjet-printed Graphene/TiO₂-NS/Graphene capacitors. The line represents a linear fit to the experimental data.

S3. Comparison with other printable dielectrics

Table S2. TiO₂-NS ink dielectric properties as compared to other printable dielectrics reported in literature.

Material	Dielectric constant	Areal Capacitance	Thickness (nm)	Breakdown Voltage	Leakage Current
Gr TiO ₂ Ns Gr [this work]	~2 At 1 kHz	3 nF cm ⁻²	~520	8.8 ± 1.7 MV cm ⁻¹	< 5x 10 ⁻⁶ A cm ²
TiO ₂ NPs [ACS Nano 2010, 4, 1893]	58 At 1 kHz	190 nF cm ⁻²	1000	NA	NA
Gr h-BN Gr [ACS Nano 2019, 13, 54]	~6 At 1kHz	2 nF cm ⁻²	1000-3000	1.9 MV cm ⁻¹	< 5x 10 ⁻⁶ A cm ²
Ag h-BN Ag [Nat. Comm. 2017, 8, 1]	~11 At 2 kHz	8.7 nF cm ⁻²	1200	NA	NA
CrAu HfO ₂ CrAu [NPJ 2D Mater. Appl. 2022, 6,1-2]	~4.8 At 2 kHz	425.6 nF cm ⁻²	10	4.2 MV cm ⁻¹	NA
Gr BiOCl Gr [ACS Appl. Electron. Mater. 2020, 2, 10, 3233]	41 ± 3	16.6 ± 1.4 nF cm ⁻²	1600	0.67 MV cm ⁻¹	NA
Au PVP/pMSSQ Au [Adv. Electron.Mater.2017, 3, 1700057]	3.85	0.67 nF cm ⁻²	4800	NA	NA
Ag BaTiO ₃ /poly(methyl methacrylate) Ag [ACS Nano 2014, 8, 12769]	35 At 1 kHz	6.195 nF cm ⁻²	5000	NA	5 x 10 ⁻⁷ A cm ²
Au triacetate Cellulose Au [Org. Elec. 2017, 41, 186]	4.57 At 1 kHz	8.1 nF cm ⁻²	325	1.54 MV cm ⁻¹	10 ⁻⁷ A cm ²