Supplemental Information

SARS-CoV-2 RapidPlex: A Graphene-Based

Multiplexed Telemedicine Platform for Rapid

and Low-Cost COVID-19 Diagnosis and Monitoring

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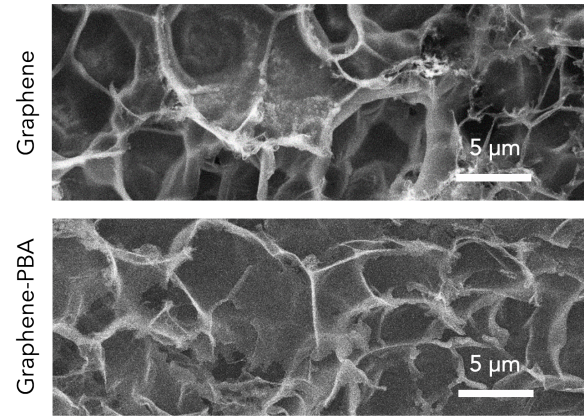
Figure S1. SEM images of the bare graphene electrode before and after modification with PBA.
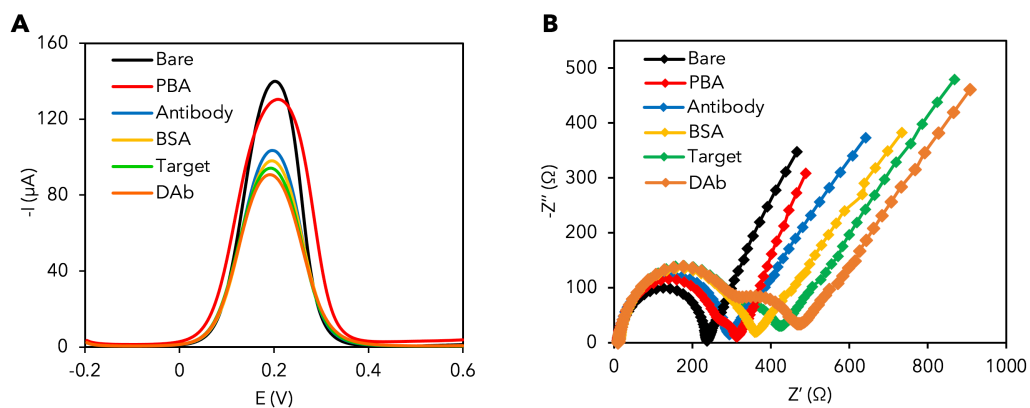
Figure S2. Electrochemical characterization of the sandwich assay-based graphene sensor modifications. Differential pulse voltammetry (DPV) (A) and Nyquist plots (B) of a graphene electrode in 0.01 M phosphate-buffered saline (PBS, pH 7.4) containing 2.0 mM of $K_4Fe(CN)_6$/$K_3Fe(CN)_6$ (1:1) after each modification step (CRP assay as a representative example): bare graphene (Bare), functionalization with PBA (PBA), immobilization of antibody (Antibody), blocking with BSA (BSA), recognition of CRP (Target), and incubation with enzyme-tagged anti-CRP antibody (DAb).
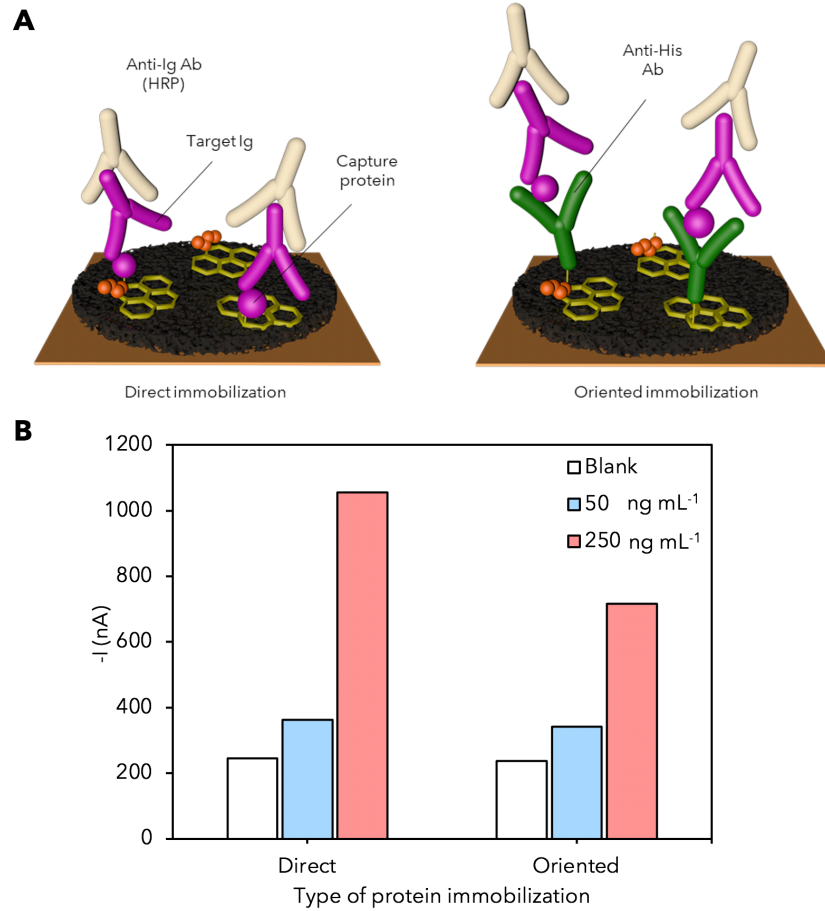
Figure S3. Characterization of the direct and oriented protein immobilization. Schemes illustrating direct and oriented immobilization of SARS-CoV-2 antigenic protein for detection of specific IgG or IgM isotypes (A), and comparison of sensor performance for S1-IgG detection using both types of immobilizations (B).
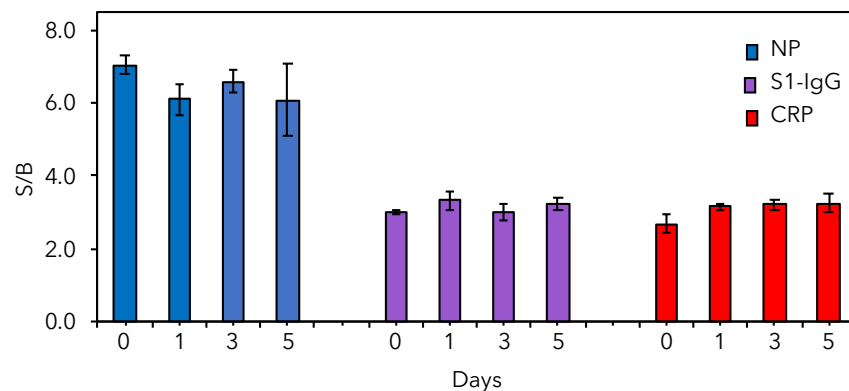
Figure S4. Stability evaluation of the LGE electrochemical biosensors. Variation of signal (S)-to-Blank (B) ratios over days of storage (at 4C in 1X PBS buffered solution) for NP, S1-IgG, and CRP sensors in the presence of 500 pg mL^{-1} NP, 250 ng mL $^{-1}$ S1-IgG, and 20 ng mL^{-1} CRP, respectively. Data are represented as mean ± SD (n = 3).
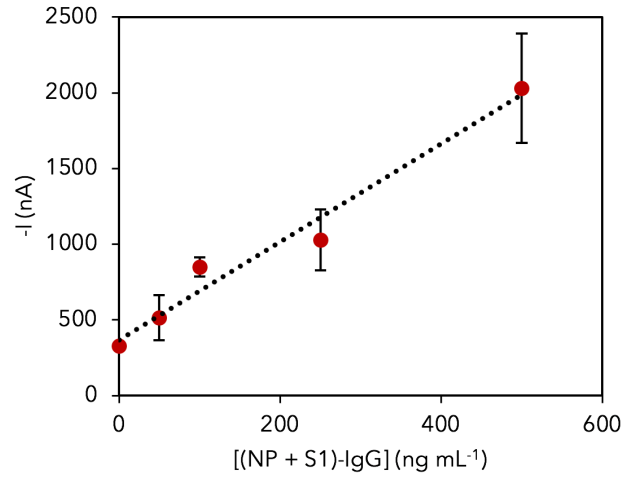
Figure S5. Calibration curve constructed for (NP + S1)-IgG detection in phosphate-buffered saline (PBS, pH 7.4) supplemented with 1.0% BSA. Data are presented as mean ± SD (n = 3).
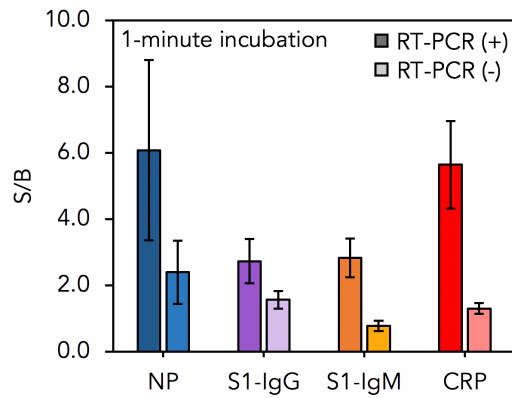
Figure S6. The signal (S)-to-blank (B) ratio of the LEG sensors obtained after 1-minute incubation with a 100X diluted serum sample from a COVID-19 positive patient (dark color) vs. a 100X diluted serum sample from a COVID-19 negative patient (light color). Data are represented as mean ± SD (n = 4).

Table S1. Patient sample summary information.

Sample Type	Sample ID	PCR Results	IgM/IgG Serology Results	Symptom Severity
Serum	PSer428	+	(+)/(+)	Moderate
	PSer499	+	(+)/(+)	Mild
	PSer565	+	(+)/(+)	Moderate
	PSer458	+	(+)/(+)	Mild
	PSer560	+	(+)/(+)	Hospitalized
	PSer454	+	(-)/(+)	Asymptomatic
	PSer619	+	(-)/(+)	Asymptomatic
	PSer494	+	(-)/(+)	Mild
	PSer379	+	(-)/(+)	Mild
	PSer400	+	(-)/(+)	Mild
	NSer4	-	(-)/(-)	n/a
	NSer5	-	(-)/(-)	n/a
	NSer6	-	(-)/(-)	n/a
	NSer7	-	(-)/(-)	n/a
	NSer8	-	(-)/(-)	n/a
	NSer9	-	(-)/(-)	n/a
	NSer10	-	(-)/(-)	n/a
Saliva	PSal530	+	(-)/(+)	Mild
	PSal664	+	(-)/(+)	Asymptomatic
	PSal675	+	(-)/(+)	Asymptomatic
	PSal658	+	(-)/(+)	Asymptomatic
	PSal604	+	(+)/(+)	Asymptomatic
	NSal3	-	(-)/(-)	n/a
	NSal4	-	(-)/(-)	n/a
	NSal5	-	(-)/(-)	n/a