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Supplementary Information

Pixel-free capacitive touch sensor using single-layer ion gel

Byoung Joon Park, Seungwoo Oh, Felix Sunjoo Kim, and Suk Tai Chang**

B. J. Park, S. Oh, Prof. F. S. Kim, Prof. S. T. Chang
School of Chemical Engineering and Materials Science, Chung-Ang University
84, Heukseok-ro, Dongjak-gu, Seoul, 06974, Republic of Korea
E-mail: fskim@cau.ac.kr, stchang@cau.ac.kr

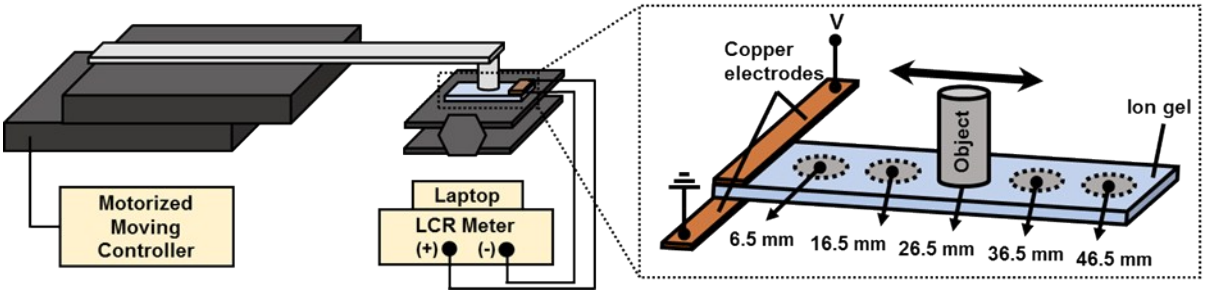

Figure S1. Schematic of the experimental setup for touch detection at different touch positions. The touch object moves only along the middle line of the touch sensing area. The sample shown in the image (dashed square) corresponds to the samples shown in **Figure 2a**.

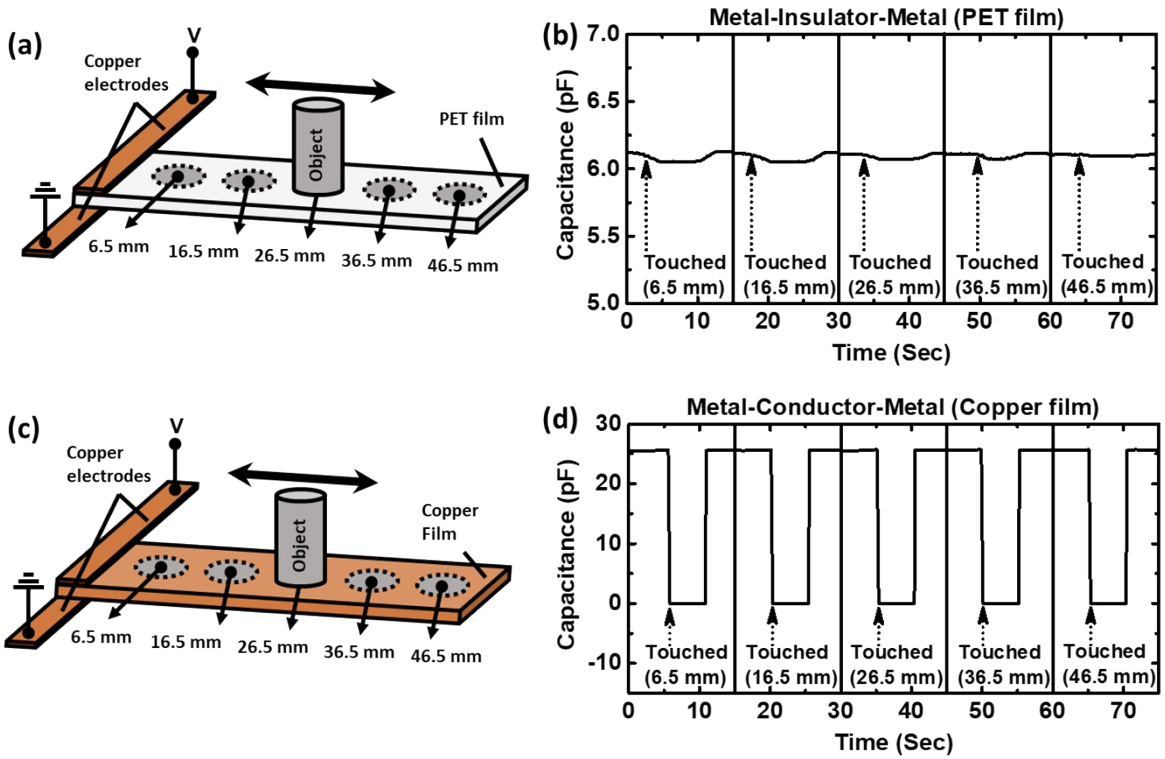

Figure S2. (a) A schematic of a lateral touch position detecting test on a PET film with metal-insulator-metal configurations (b) Capacitance of the sensor fabricated by the insulator (PET) measured by real-time depending on the touch location. (c) A schematic of a lateral touch position detecting test on a copper film with metal-conductor-metal configurations. (d) Capacitance of the sensor fabricated by the conductor (Copper) measured by real-time depending on the touch location.

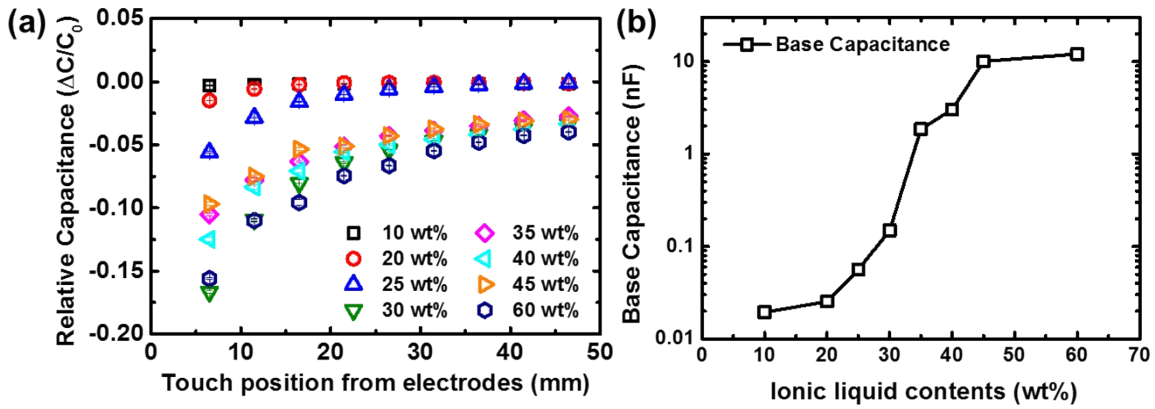

Figure S3. (a) Relative capacitance change as a function of distance between electrodes and touch positions under different ionic liquid contents (10, 20, 25, 30, 35, 40, 45, and 60 wt% ionic liquid). (b) Base capacitance value as a function of the ionic liquid content.

Table S1. Rational fitting equation of the capacitance change (Δ*C*) and the fitting parameters corresponding to each ionic liquid content.

Equation	Ionic liquid content [wt %]	*S*	R^2
$\Delta C = -S/d$ [a)]	10	0.0002	0.9377
	20	0.0022	0.7847
	25	0.0229	0.9889
	30	0.1655	0.9912
	35	1.3443	0.9335
	40	2.2660	0.9723
	45	5.9412	0.9604
	60	12.3441	0.9345

a) *S* is fitting parameter for the rational fitting equation; *d* is the distance from the electrodes to the touch point.

Table S2. Jonscher power law fitting equation and fitting parameters corresponding to each ionic liquid content.

Equation	Ionic liquid content [wt %]	σ_{Ionic}	k	***p***	R^2
$\sigma_{AC} = \sigma_{Ionic} + k \cdot \omega^{p}$ [a)]	10	6.61E-08	4.48E-12	0.7698	0.9992
	20	5.41E-08	6.66E-14	0.7612	0.9922
	25	1.15E-07	3.03E-11	0.6664	0.9980
	30	1.59E-07	4.89E-11	0.6487	0.9982
	35	4.44E-07	1.19E-10	0.6305	0.9954
	40	5.11E-07	1.06E-10	0.6335	0.9906
	45	1.06E-06	7.95E-09	0.6301	0.9478
	60	1.67E-06	2.12E-06	0.6349	0.8930

a) σ_{Ionic}, *k*, and *p* are fitting parameters for the Jonscher power law fitting equation; ω is the frequency of the AC voltage.

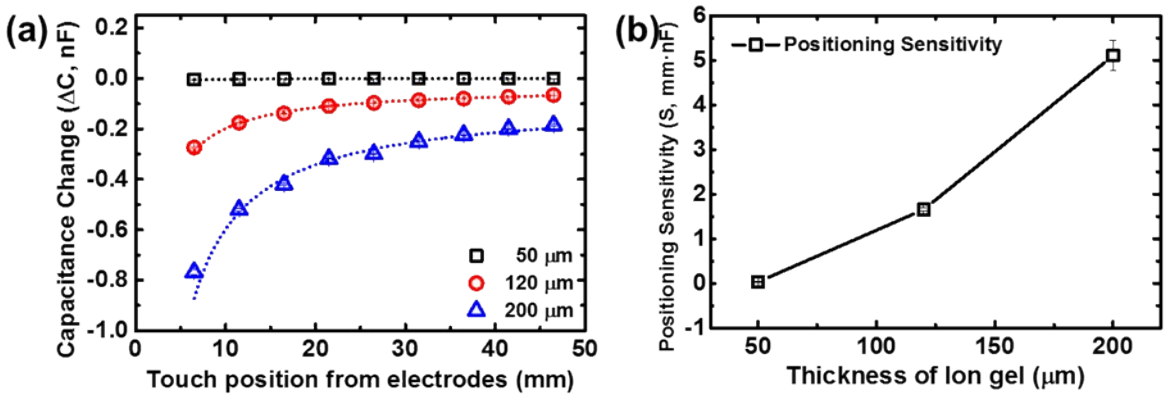

Figure S4. (a) Capacitance change as a function of the touch position under different ion gel thicknesses (50, 120, and 200 μm). Dashed lines are the best fits to a function inversely proportional to the distance from the electrodes. The experiments were performed at AC 1 V and 5 kHz. (b) Positioning sensitivity and ionic conductivity as a function of ion gel thickness.

Table S3. Rational fitting equation of the capacitance change (Δ*C*) and the fitting parameters corresponding to each ion gel thickness.

Equation	Thickness of ion gel [μm]	*S*	R^2
$\Delta C = -S/d$ [a)]	50	0.0346	0.9936
	120	1.6563	0.9951
	200	5.1073	0.9656

[a)] *S* is fitting parameter for the rational fitting equation; *d* is the distance from the electrodes to the touch point.