Supporting Information

Electrochemiluminescence Imaging of Membrane Carcinoembryonic Antigen at Single Tissue Sections

Junwei Shi[a#], Dongni Han[b#], Zengyu Feng[c], Dechen Jiang[b], Depeng Jiang[a*]

a. Department of Respiratory Medicine, the Second Affiliated Hospital, Chongqing Medical University, Chongqing, 400010, China

b. State Key Laboratory of Analytical Chemistry for Life Science, School of Chemistry and Chemical Engineering, Nanjing University, Nanjing, Jiangsu, 210023, P. R. China;

c. Department of General Surgery, The Second Affiliated Hospital, School of Medicine, Zhejiang University, Hangzhou, 310009, China.

* Author to whom correspondence should be addressed.

Email: gdp116@hospital.cqmu.edu.cn (DP. Jiang)

Figure S1. H&E image of adjacent slices of the section presented in Figure 2. The triangle marks represent ducts and the arrows represent acini. The magnified view shows a cluster of cancer cells with pathological mitotic figures.

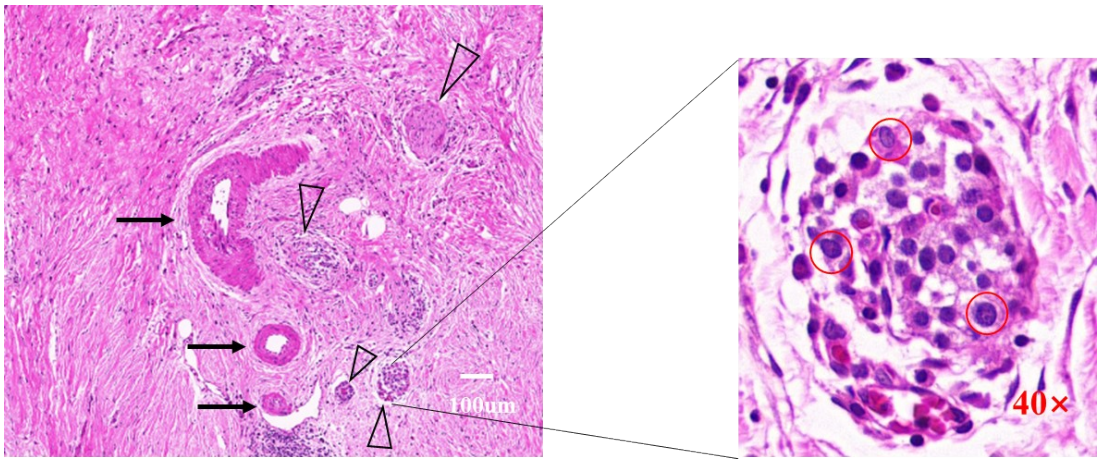

Figure S2. (a) Photo of microscopic apparatus for ECL imaging. (b) Schematic of the electrochemical cell.

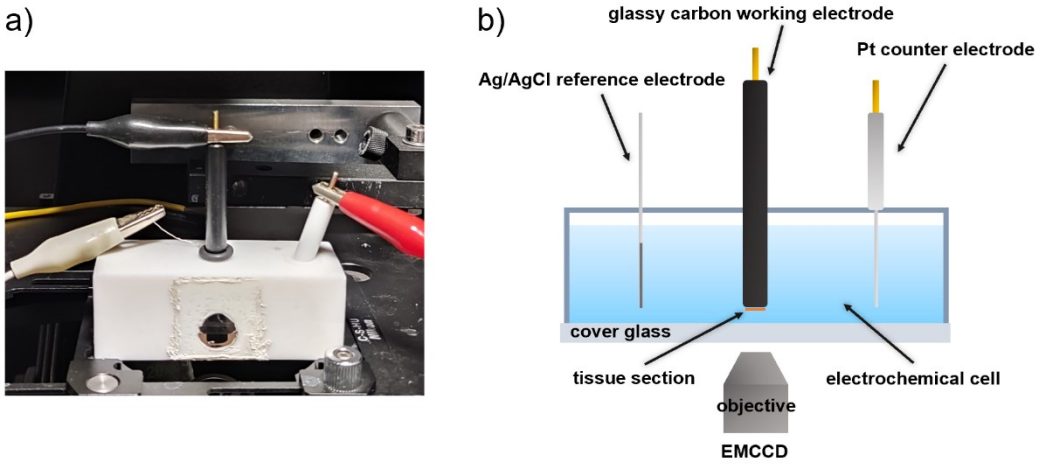

Figure S3. Voltammetry (black curve) and ECL (red curve) signals recorded in PBS (pH = 7.4) containing 200 mM TPA on a GC electrode where a tissue section with CEA Ab@Ru was attached. Scan rate: 0.5 V/s.

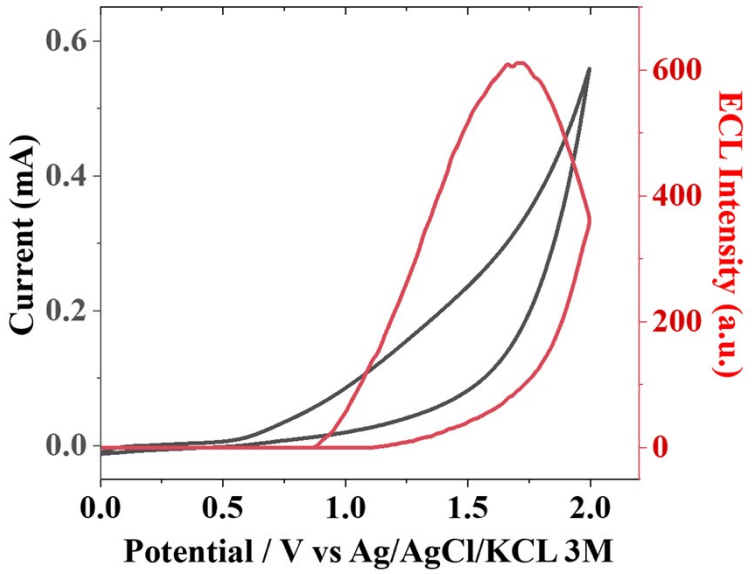

Figure S4. (a) Cyclic voltammetry and (b) ECL intensity of three GC electrodes recorded in PBS (pH = 7.4) containing 200 mM TPA. A bare GC electrode was tested as a blank control. An electrode modified with 0.05% Nafion was set as a carrier control. An electrode decorated with 0.05% Nafion and 5 μg /mL CEA antigen standards was investigated as an experimental group. Scan rate: 0.5 V/s.

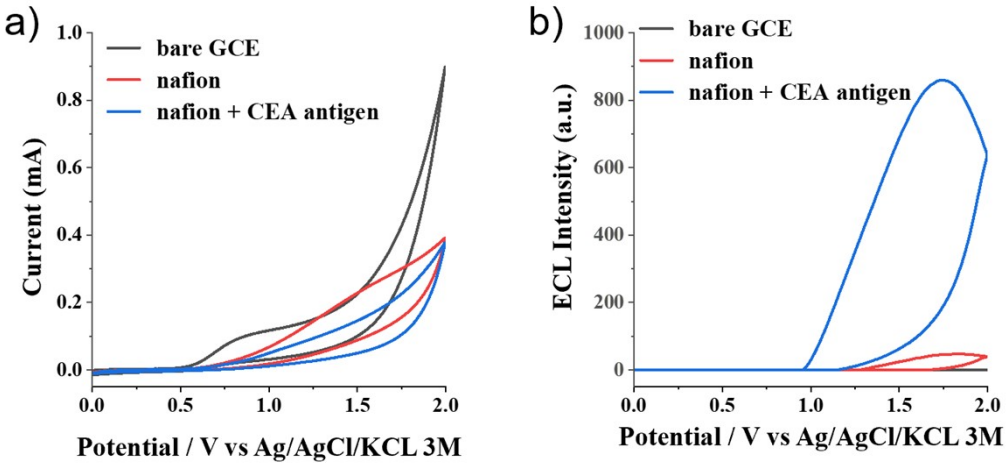

Figure S5. Overlay of the FL and ECL signals on the same region of interest. The overlay procedure was performed via programming using MATLAB software. The region of yellow corresponds to the overlapping from the FL (green) and ECL (blue) signals.

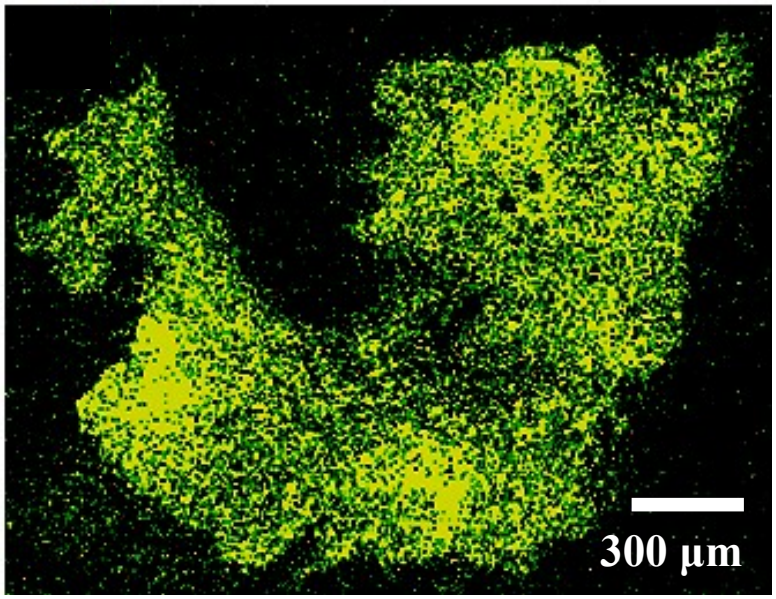

Figure S6. (a) Tissue sections were labeled with anti cTnT antibody and IgG Ab@Ru-Cy5 antibody before attaching to a GC electrode. (b) An ECL image of a tissue section as negative control. ECL was stimulated by a voltage of 1.7 V with 200 mM TPrA.

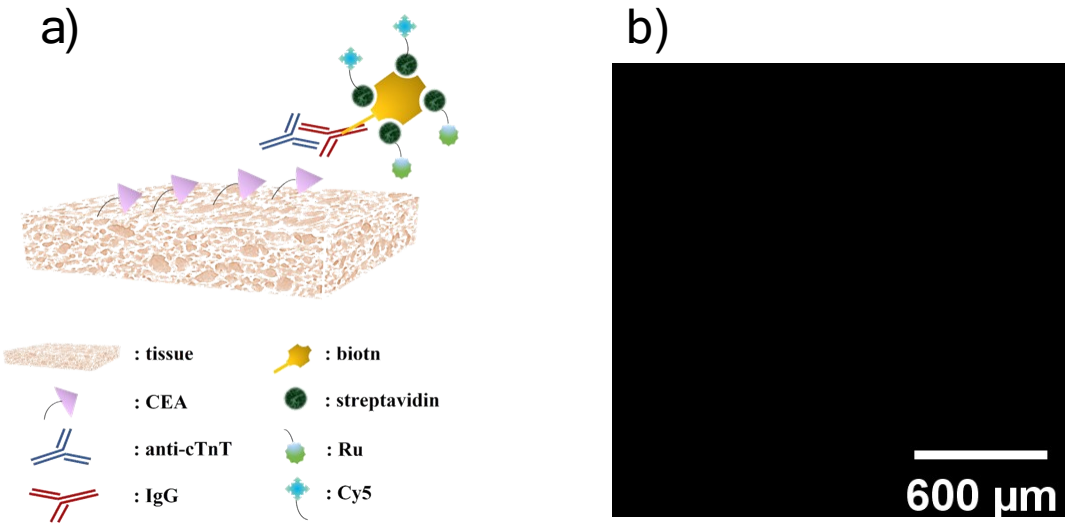

Figure S7. The ECL images of three CEA Ab@Ru labeled tissue sections recorded in 0.1M PBS (pH = 7.4) containing (a) 100 mM TPA, (b) 150 mM TPA, and (c) 200 mM TPA, respectively. Exposure time: 10 s. (d) Mean ECL intensity as a function of TPrA concentration extracted from (a-c).

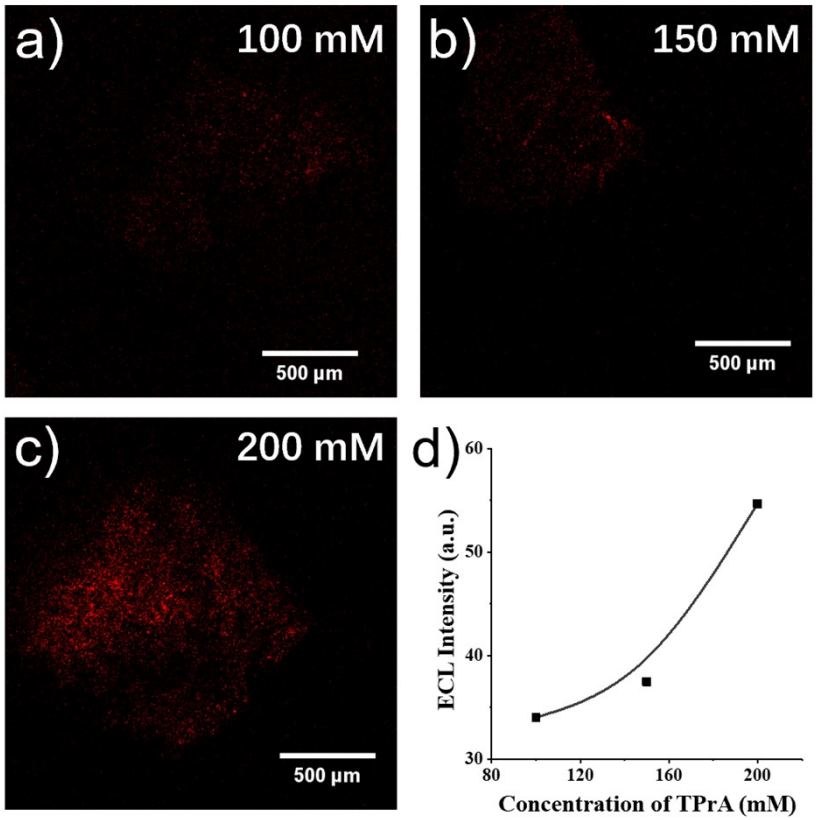

Figure S8. The ECL images of (a) 246 μM, (b) 492 μM, and (c) 985 μM CEA Ab@Ru labeled tissue sections recorded in 0.1M PBS (pH = 7.4) containing 200 mM TPA, respectively. Exposure time: 10 s. (d) Mean ECL intensity as a function of CEA Ab@Ru concentration extracted from (a-c).

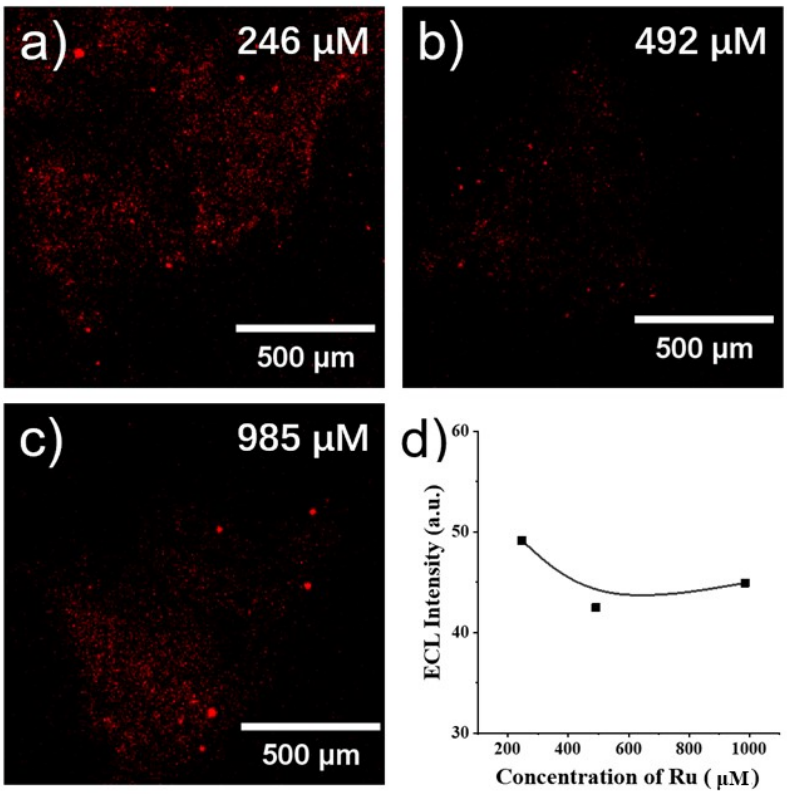

Figure S9. The ECL images of 246 μM CEA Ab@Ru labeled tissue sections recorded in 0.1M PBS

containing 200 mM TPA at a pH of (a) 6.8, (b) 7.4, (c) 8.7, (d) 9.6, and (e) 10.1, respectively. The yellow arrows in (e) indicate the bubbles generated on the electrode surface. Exposure time: 10 s. (f) Mean ECL intensity as a function of pH values extracted from (a-e).

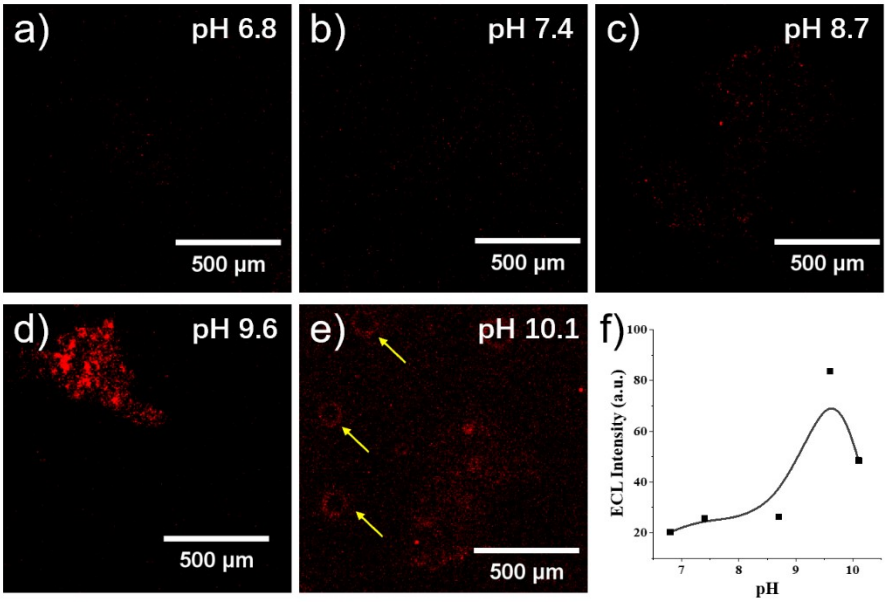

Figure S10. The ECL images of 246 μM CEA Ab@Ru labeled tissue sections recorded in 0.1M

PBS (pH = 9.6) containing 200 mM TPA with an exposure time of (a) 5 s, (b) 10 s, and (c) 15 s, respectively.

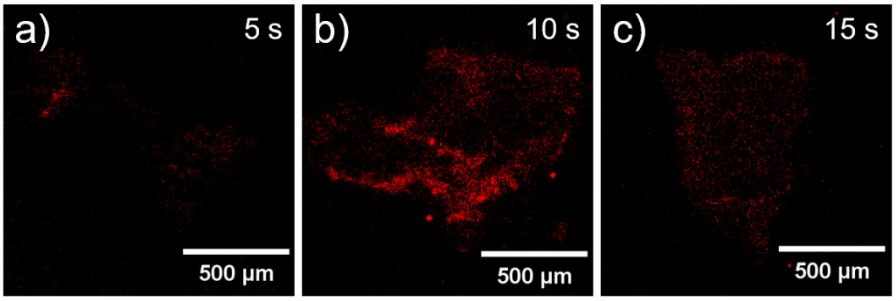

Figure S11. SEM images of tissue sections (a) with and (b) without permeabilization treatment.

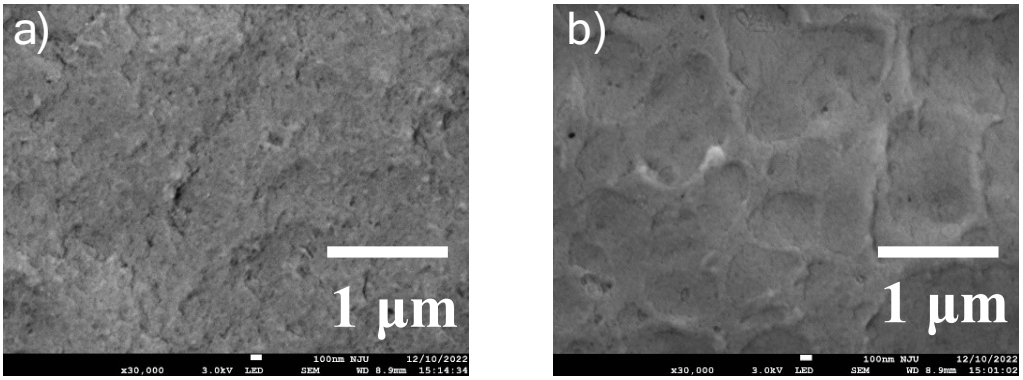

Figure S12. H&E images of (a) cancerous and (b) paracancerous tissues of a PDAC patient. The triangle marks represent ducts, arrows represent acini, and circles represent stroma.