

## Description of additional supplementary videos

### File name: Video S1

Time-stamped electrochemiluminescence images recorded with a Nikon Eclipse Ti2-U inverted microscope fitted with a Plan Apo  $\lambda$  4 $\times$ /0.45 objective (part 88-378, Nikon, CFI Plan Fluor) and setting a 1 s exposure time and 0.5 frame/s. A  $-2.0$  V bias was applied to the platinum mesh  $\sim 5.0$  s after the start of the video recording. The platinum mesh is immersed in an oxygen-saturated  $0.43 \times 10^{-3}$  M **AMP-luc** solution in 0.2 M Bu<sub>4</sub>NClO<sub>4</sub>/DMSO. No emission filter. Selected video frames from this video are reproduced in Figure 1c of the main text.

### File name: Video S2

Time-stamped electrochemiluminescence images recorded with a Nikon Eclipse Ti2-U inverted microscope fitted with a Plan Apo  $\lambda$  10 $\times$ /0.45 objective (part 88-379, Nikon, CFI Plan Fluor) and setting a 500 ms exposure time and 2.0 frame/s. A  $-2.0$  V bias was applied to the platinum mesh  $\sim 1.5$  s after the start of the video recording. The platinum mesh is immersed in an oxygen-saturated  $0.43 \times 10^{-3}$  M **AMP-luc** solution in 0.2 M Bu<sub>4</sub>NClO<sub>4</sub>/DMSO. No emission filter. Selected video frames from this video are reproduced in Figure 4a–c of the main text.

### File name: Video S3

Time-stamped fluorescence recorded with a Nikon Eclipse Ti2-U inverted microscope fitted with a Plan Apo  $\lambda$  10 $\times$ /0.45 objective (part 88-379, Nikon, CFI Plan Fluor) and setting a 20 ms exposure time and 6.0 frame/s. A  $-2.0$  V bias was applied to the platinum mesh  $\sim 2.3$  s after the start of the video recording. The platinum mesh is immersed in an oxygen-saturated  $0.43 \times 10^{-3}$  M **AMP-luc** solution in 0.2 M Bu<sub>4</sub>NClO<sub>4</sub>/DMSO. A FITC filter/dichroic mirror cube (474 nm excitation wavelength and 525 nm emission wavelength) was used. Selected video frames from this video are reproduced in Figure S17a–c of the supporting information.