Electronic Supporting Information for

Ruthenium(II)-polypyridyl doped zirconium(IV) metal-organic frameworks as solid-state electrochemiluminescence detectors

Meng Cai, Quentin Loague, Jie Zhu, Shaoyang Lin, Pavel M. Usov and Amanda J. Morris*

Department of Chemistry, Virginia Polytechnic Institute and State University, 800 W. Campus Drive Blacksburg, Virginia 24061, United States

*To whom correspondence should be addressed.

E-mail: ajmorris@vt.edu.

Supporting figures & analysis

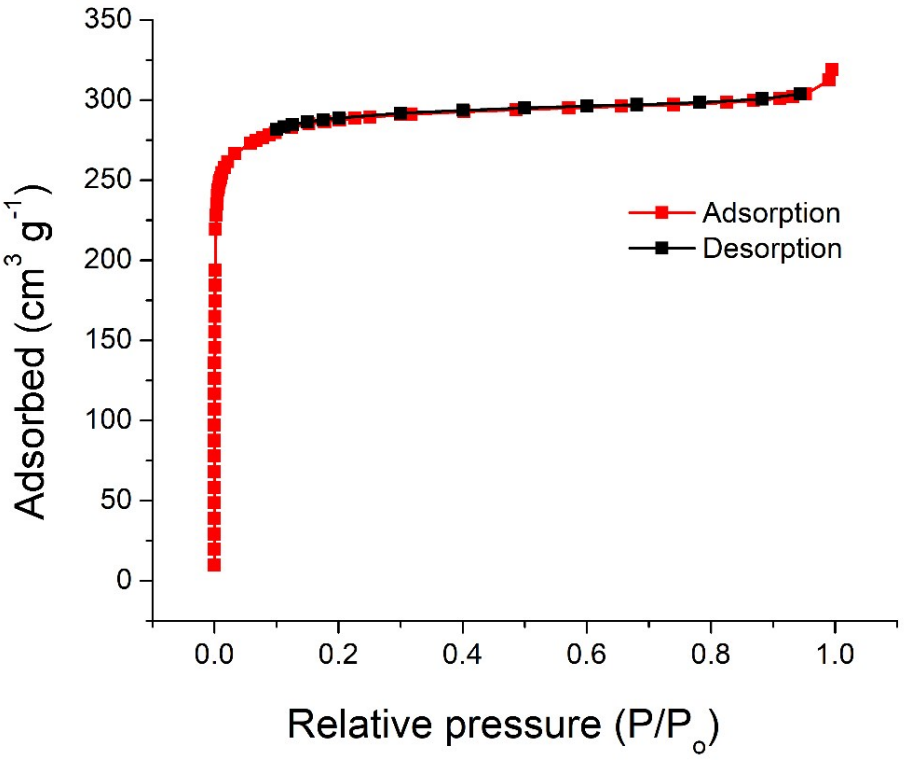

Fig. S1 N_2 adsorption-desorption isotherm of UiO-67-Ru powders at 77 K, 1 atm.

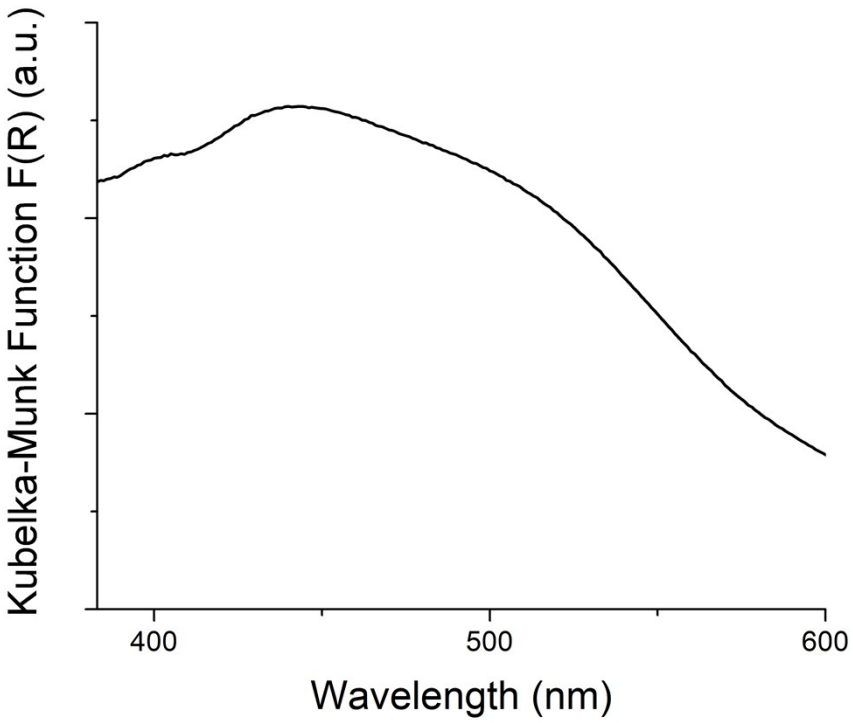

Fig. S2 UV-Visible spectrum of UiO-67-Ru@FTO in MeCN

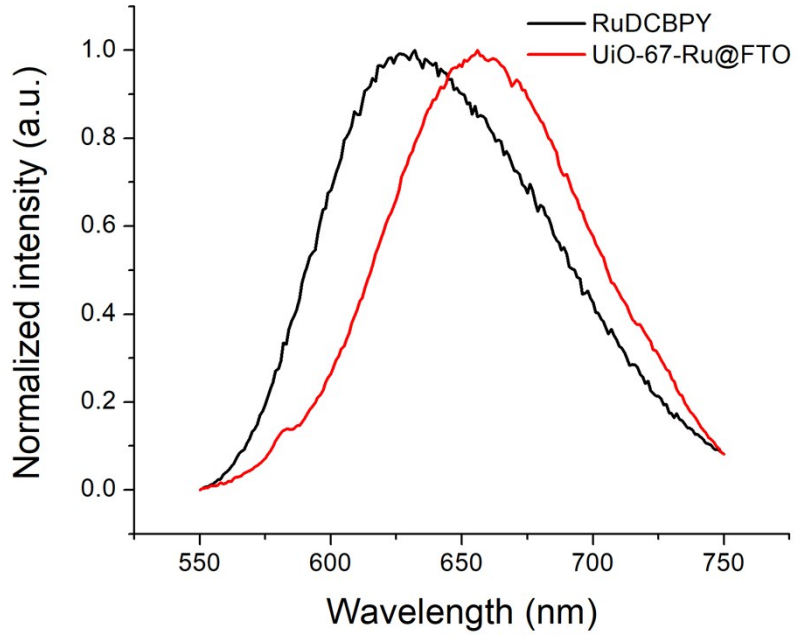

Fig. S3 Steady-state emission spectra of UiO-67-Ru@FTO and RuDCBPY in MeCN

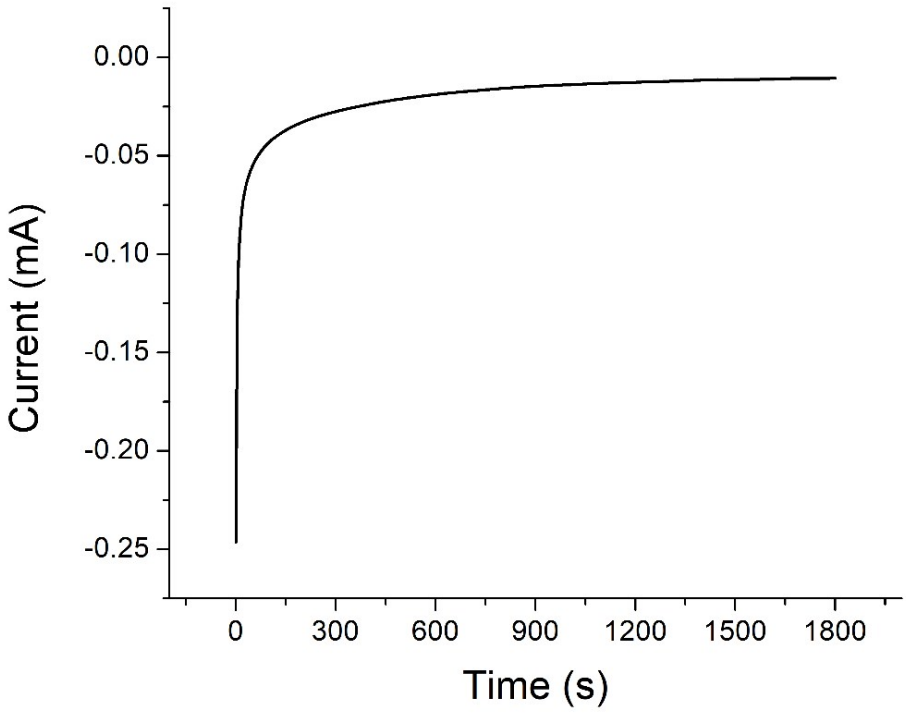

Fig. S4 Amperometry of UiO-67-Ru@FTO in MeCN with a controlled potential at 1.38 V vs. Fc/Fc^{+} for 30 min

To calculate electroactive Ru^{2+} coverage, the charge Q can be obtained by integration. Based on the assumption that the charge that passed during electrolysis (0-1800 s) was only due to the one-electron transfer process of Ru^{2+}/Ru^{3+} redox couple, and all electroactive Ru contribute to the charge, the amount of Ru can be calculated using equation $n = \frac{Q}{F}$, where n is the number of moles of Ru^{2+}, Q is the charge, and F is Faraday constant. The coverage of electroactive Ru^{2+} is thereby obtained by n over the film area (2.75 cm^2). The total amount of Ru^{2+} can be obtained from ICP-MS of digested films. Finally, the ratio of electroactive coverage calculated from potential-step electrolysis to the total Ru content determined by ICP-MS.

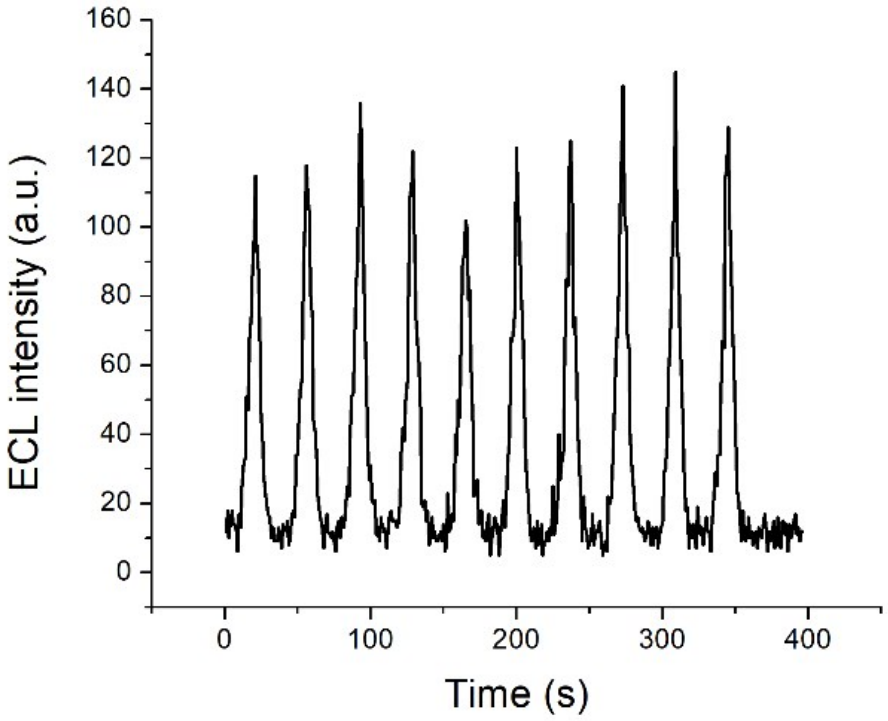

Fig. S5 ECL of solution-based $Ru(bpy)_3^{2+}$/TPA system in the presence of 20 mM TPA in MeCN containing 0.1 M $LiClO_4$

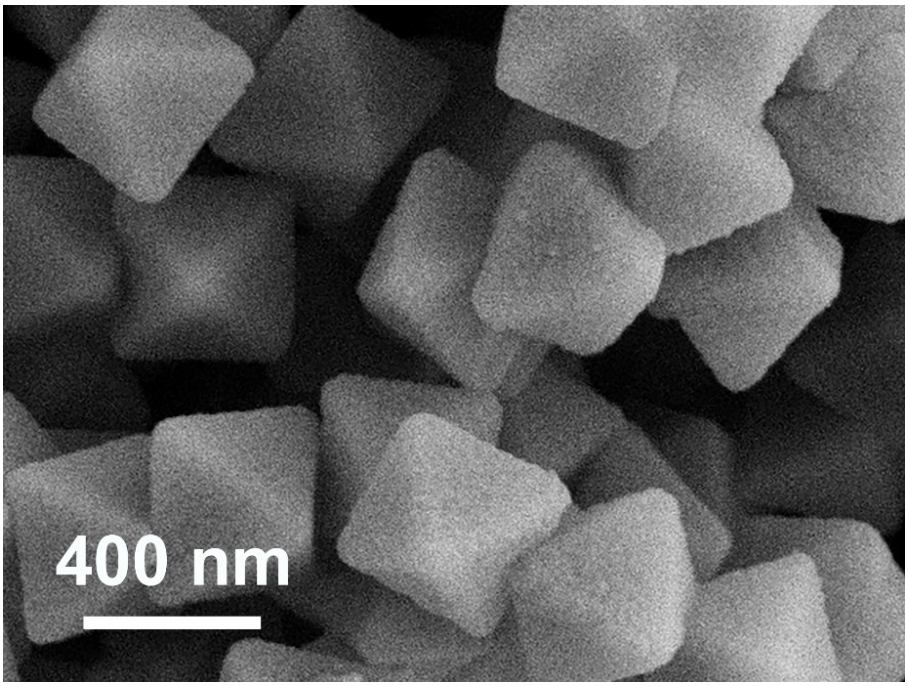

Fig. S6 SEM of UiO-67-Ru@FTO after ECL measurement

Associated with Fig. 4C

The linear relationship between ECL intensity and TPA concentration ranging from 0.04 mM to 20 Mm can be represented by equation I_{ECL} (a.u.) = 129.08857 + 413.62138C_{TPA} (mM), with a correlation coefficient of 0.99747.

Associated with Fig. 5

The curve can be fitted to the equation I_{ECL}/I_0=1.87112-0.74028 log(C_{DA}) (μM) with a correlation coefficient of 0.96036.