Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

SUPPORTING INFORMATION

Understanding the ECL interaction of luminol and $Ru(bpy)_3^{2+}$ luminophores by spectro-electrochemiluminescence

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Materials and Methods

a. Reagents

Luminol sodium salt (Sigma-Aldrich), tris(2,2'-bipyridyl)dichlororuthenium(II) hexahydrate ($Rubpy_3Cl_2$, Sigma-Aldrich), hydrogen peroxide solution (50 wt. %, Sigma-Aldrich), tripropylamine (TPrA, Sigma-Aldrich) and o-phosphoric acid (85%, Merck) were used as received. 0.1 M phosphate buffer solution pH 8 was prepared adjusting pH with sodium hydroxide (NaOH, Sigma-Aldrich) solution. All chemicals were analytical grade. Aqueous solutions were prepared using ultrapure water (Direct-Q^{TM} 5 system, Millipore).

b. Instrumentation

Screen-printed carbon electrodes (DRP-110, Metrohm DropSens) were used to perform all experiments. Electrodic system consists of a flat ceramic card with a circular carbon working electrode (4 mm diameter), a carbon auxiliary electrode and a silver pseudo-reference electrode.

ECL measurements were performed at room temperature using DRP-SpectroECL instrument (Metrohm DropSens) with a microspectrometer cell as detector. Additionally, DRP-SpectroECL was also used with a photodiode detector cell (DRP-ECLPHOTODIODCELL, Metrohm DropSens). Data acquisition as well as data treatment was done with DropView SPELEC software.

c. Methods

All ECL experiments were carried out at room temperature by cyclic voltammetry, scanning the potential from 0.00 V to +1.50 V and back to 0.00 V at 0.05 $V.s^{-1}$ in phosphate buffer solution (pH 8). Spectra were recorded using the microspectrometer cell and integration time of 1000 ms. ECL signals recorded with photodiode cell were obtained without amplification factor (x1).

Figures

Figure S1

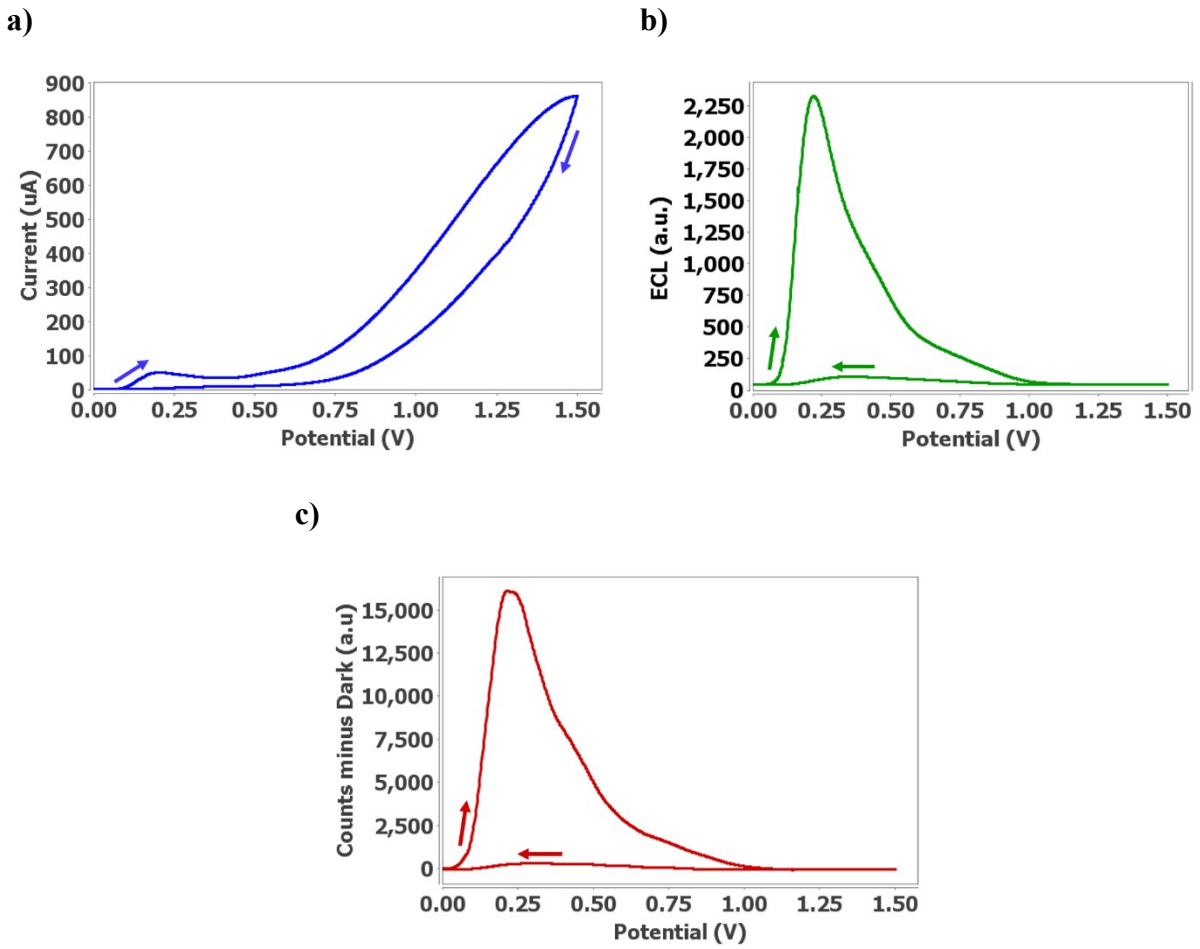

Figure S1. (a) Electrochemical response and ECL signals obtained with (b) photodiode cell. (c) Evolution of emission band at 420 nm with potential. These signals have been obtained for a solution containing 1 mM of luminol and 50 mM of hydrogen peroxide in 0.1 M phosphate buffer pH 8.0.

Figure S2

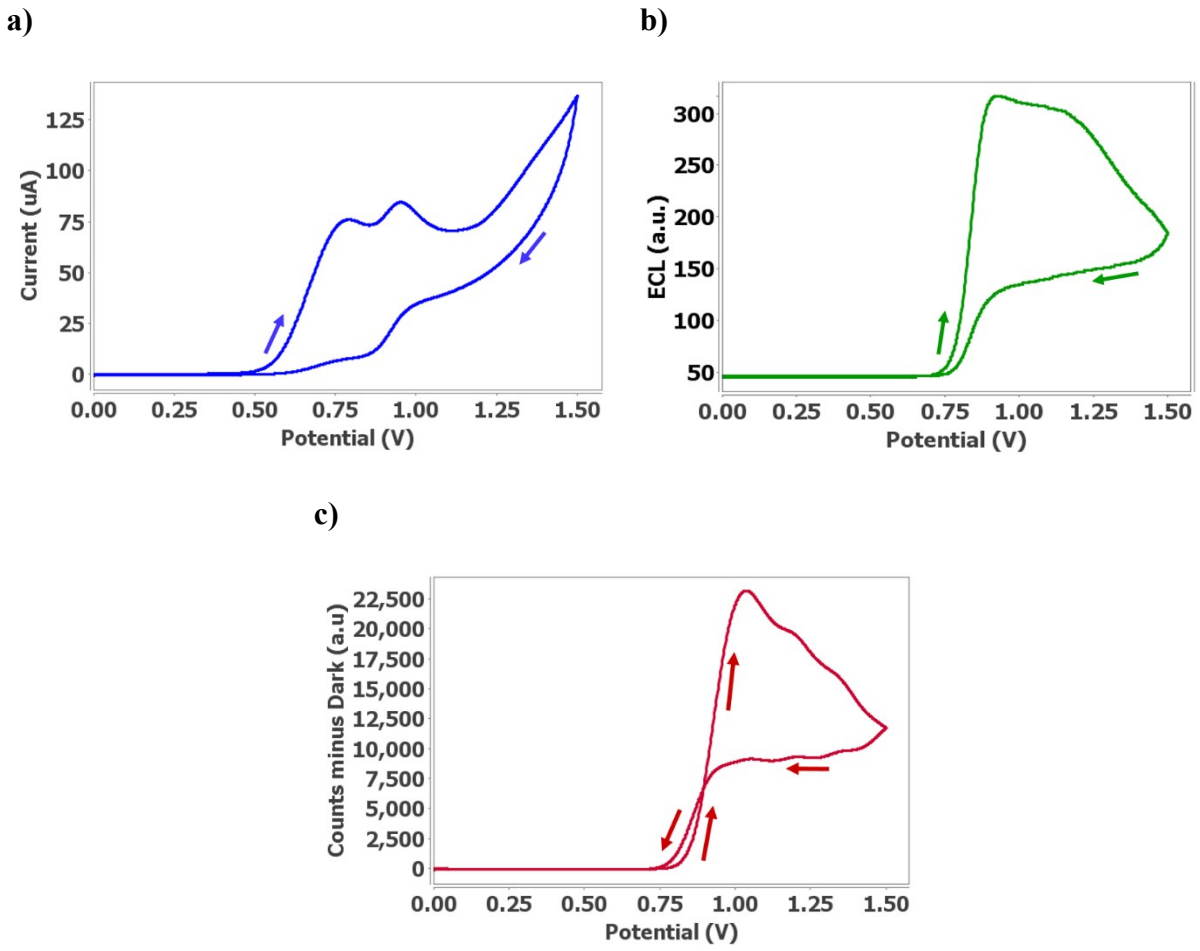

Figure S2. (a) Electrochemical response obtained with 1 mM $Ru(bpy)_3^{2+}$ and 50 mM TPrA in 0.1 M phosphate buffer pH 8 solution. (b) ECL signal obtained with 0.1 mM $Ru(bpy)_3^{2+}$ and 50 mM TPrA in 0.1 M phosphate buffer pH 8 solution using the photodiode cell. (c) Evolution of emission band at 620 nm with potential obtained under the same experimental conditions than (a) using the microspectrometer cell.

Figure S3

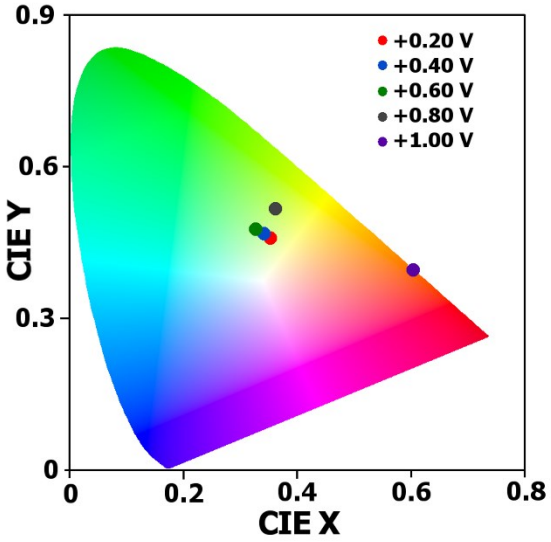

Figure S3. CIE color coordinates of 1 mM of luminol, 1 mM of $Ru(bpy)_3^{2+}$, 50 mM of hydrogen peroxide and 50 mM of TPrA in 0.1 M phosphate buffer pH 8.0.luminol at +0.20 V (red dot), +0.40 V (blue dot), +0.60 V (green dot), +0.80 V (grey dot) and +1.00 V (purple dot).

Figure S4

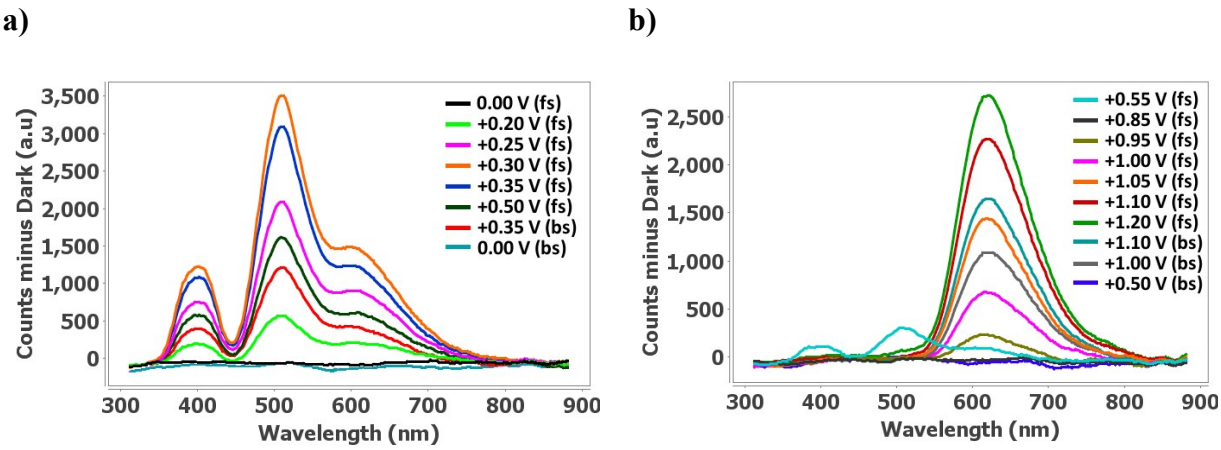

Figure S4. ECL spectra obtained in 1 mM luminol, 1 mM $Ru(bpy)_3^{2+}$, 50 mM hydrogen peroxide and 50 mM TPrA in 0.1 M phosphate buffer pH 8 with microspectrometer cell (a) from 0.00 V to +0.50 and (b) from +0.50 V to +1.50 V. fs: forward scan; bs: backward scan.

Figure S5

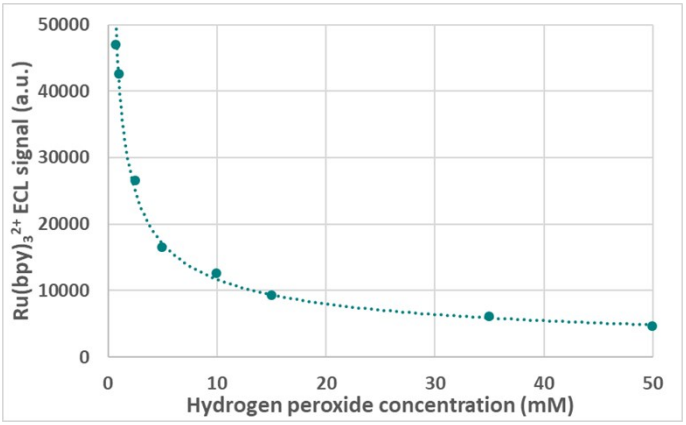

Figure S5. Dependence of ECL intensity of 1 mM $Ru(bpy)_3^{2+}$ and 50 mM TPrA on the concentration of hydrogen peroxide from 1 to 50 mM in 0.1 M phosphate buffer pH 8. Maximum ECL signal was considered when potential was scanned from 0.50 V to +1.50 V.