

Electronic Supplementary Information

Magneto-Electrochemical Method for Chiral Recognition of Amino Acid Enantiomers

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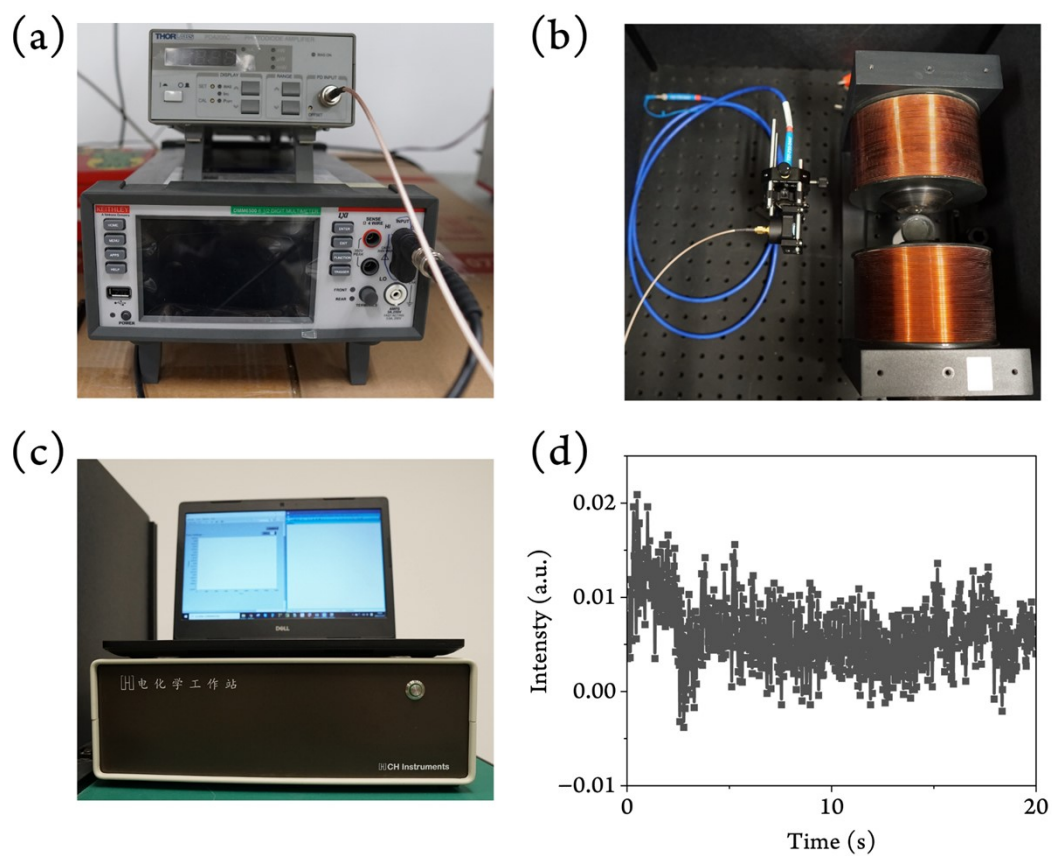


Fig. S1 (a) Photo of amplifier and digital multimeter (b) Photo of In-situ ECL measurements under magnetic field and silicon detector (c) Photo of electrochemical workstation (d) Background Noise Collected.

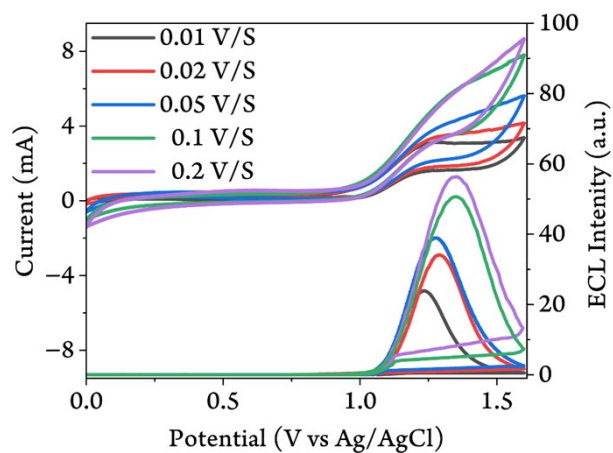


Fig. S2 Cyclic voltammetric (CV) and electrochromic luminescence versus voltage (ECL-V) curves measured from the electrochemical cell containing 1 mmol/L $\text{Ru}(\text{bpy})_3^{2+}$, 100 mmol/L TPrA, and 0.1 mol/L NaH_2PO_4 . Scan rate: 0.01, 0.02, 0.05, 0.1, and 0.2 V/s.

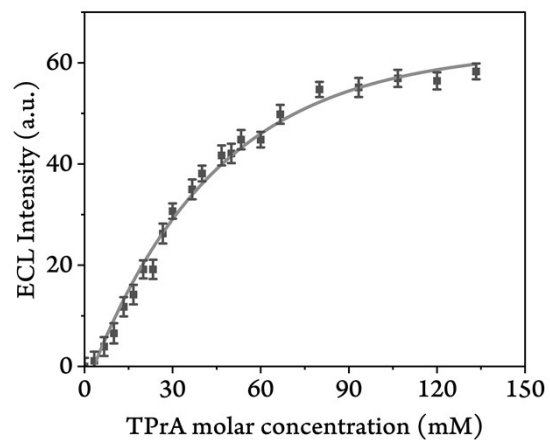


Fig. S3 ECL intensity is measured from the electrochemical cell containing 1 mmol/L $\text{Ru}(\text{bpy})_3^{2+}$, 0.04-130 mmol/L TPrA, and 0.1 mol/L NaH_2PO_4 . Scan rate: 200 mV/s.

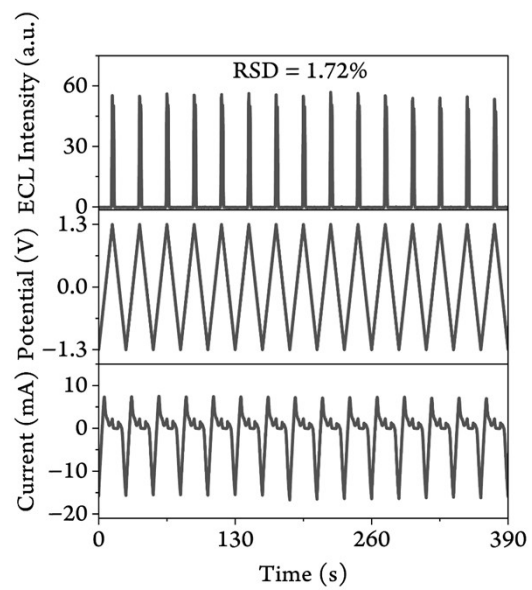


Fig. S4 ECL, voltage and current versus time curves measured from the electrochemical cell containing 1 mmol/L $\text{Ru}(\text{bpy})_3^{2+}$, 100 mmol/L TPrA, and 0.1 mol/L NaH_2PO_4 . Scan rate: 0.2 V/s.

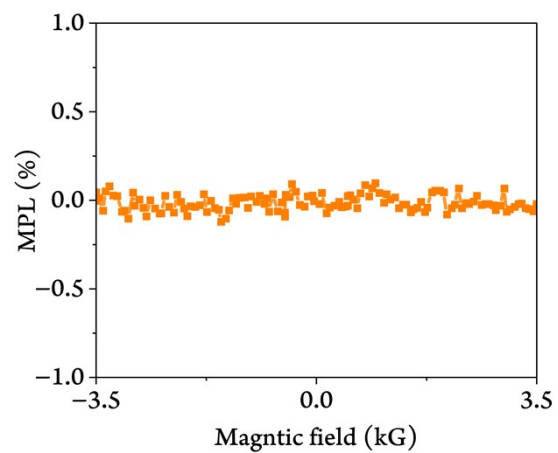


Fig. S5 MPL response as a function of applied field measured from the 1 mmol/L Ru(bpy)₃²⁺ solution (MPL = [PL(B)-PL(0)]/PL(0)×100%,; excitation wavelength: 450 nm).

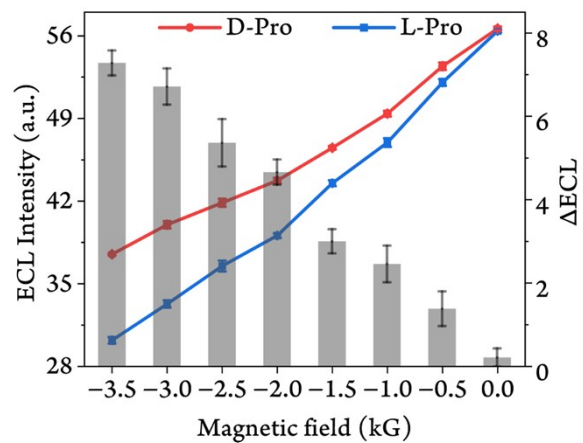


Fig. S6 ECL intensity (at 1.3 V vs. Ag/AgCl) and ECL difference (Δ ECL) measured after reversing the magnetic field direction. The electrolytes contain 1 mM Ru (bpy)₃²⁺ and 100 mM TPrA with the addition of 10⁻⁹ M L-Pro (blue line) or 10⁻⁹ M D-Pro (red line).

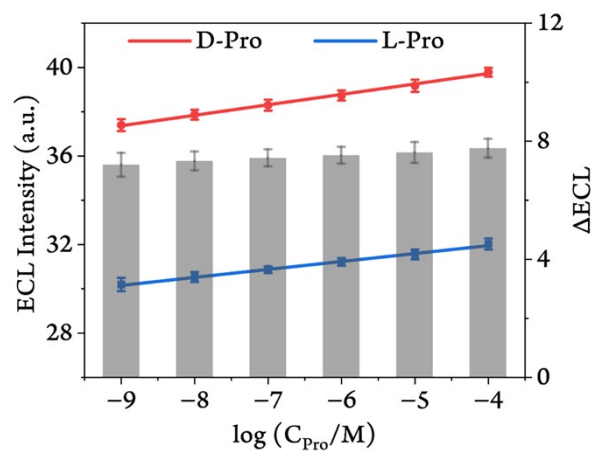


Fig. S7 ECL intensity as a function of the concentration of L-/D-Pro solutions (10^{-9} to 10^{-4} mol/L) added into the electrolytes under a field of 3.5 kG. The electrolytes containing 1 mM $\text{Ru}(\text{bpy})_3^{2+}$, 100 mM TPrA, and 0.1 M NaH_2PO_4 . Scan rate: 200 mV/s. The ΔECL indicates the ECL difference between adding L- and D-Pro solutions at the same concentration. The fitting curves are $I_{\text{L-Pro}}(3.5 \text{ kG}) = 33.392 + 0.359 \times \log C_{\text{L-Pro}}$ and $I_{\text{D-Pro}}(3.5 \text{ kG}) = 41.615 + 0.472 \times \log C_{\text{D-Pro}}$ for L- and D-Pro, respectively.

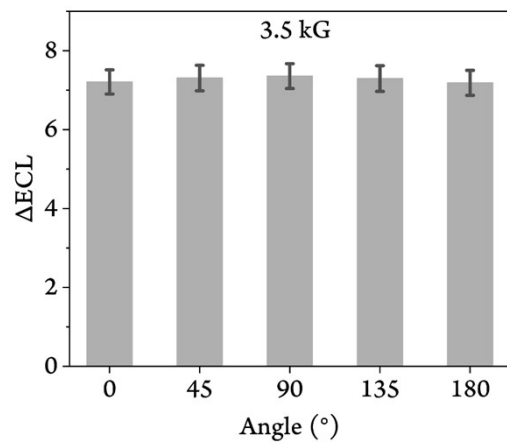


Fig. S8 The change in ECL intensity under the 3.5 kG magnetic field at different angles. The electrolytes containing 1 mM $Ru(bpy)_3^{2+}$, 100 mM TPrA, 10^{-9} M L/D-Pro and 0.1 M NaH_2PO_4 . Scan rate: 200 mV/s.

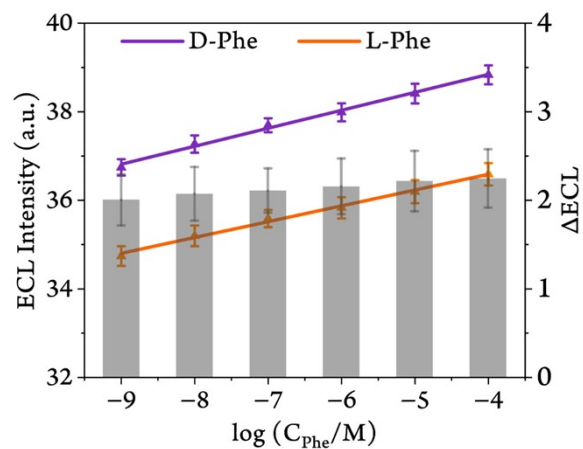


Fig. S9 ECL intensity as a function of the concentration of L-/D-Phe solutions (10^{-9} to 10^{-4} mol/L) added in the electrolytes under a field of 3.5 kG field. The electrolytes containing 1 mM $\text{Ru}(\text{bpy})_3^{2+}$, 100 mM TPrA, and 0.1 M NaH_2PO_4 . Scan rate: 200 mV/s. The ΔECL indicates the ECL difference between adding L- and D-Phe solutions at the same concentration. The fitting curves are $I_{\text{L-Phe}}(3.5 \text{ kG}) = 38.107 + 0.357 \times \log C_{\text{L-Phe}}$ and $I_{\text{D-Phe}}(3.5 \text{ kG}) = 40.466 + 0.406 \times \log C_{\text{D-Phe}}$ for L- and D-Phe, respectively.

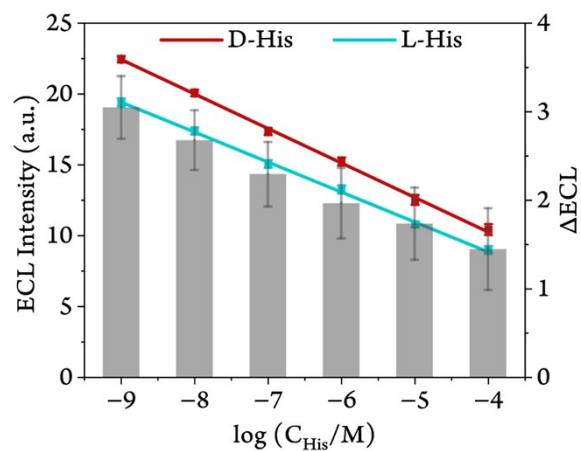


Fig. S10 ECL intensity as a function of the concentration of L-/D-His solutions (10^{-9} to 10^{-4} mol/L) added in the electrolytes under a field of 3.5 kG field. The electrolytes containing 1 mM $\text{Ru}(\text{bpy})_3^{2+}$, 100 mM TPrA, and 0.1 M NaH_2PO_4 . Scan rate: 200 mV/s. The ΔECL indicates the ECL difference between adding L- and D-His solutions at the same concentration. The fitting curves are $I_{\text{L-His}}(3.5 \text{ kG}) = 0.387 - 2.115 \times \log C_{\text{L-His}}$ and $I_{\text{D-His}}(3.5 \text{ kG}) = 0.523 - 2.434 \times \log C_{\text{D-His}}$ for L- and D-His, respectively

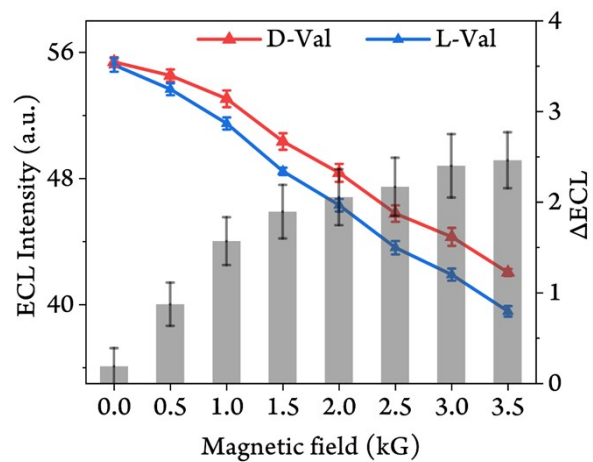


Fig. S11 ECL intensity (at 1.3 V vs. Ag/AgCl) and Δ ECL measured at various magnetic field strengths. The electrolytes contain 1 mM Ru (bpy)₃²⁺ and 100 mM TPrA (black line), with the addition of 10⁻⁹ M L-Val (blue line) or 10⁻⁹ M D-Val (red line).

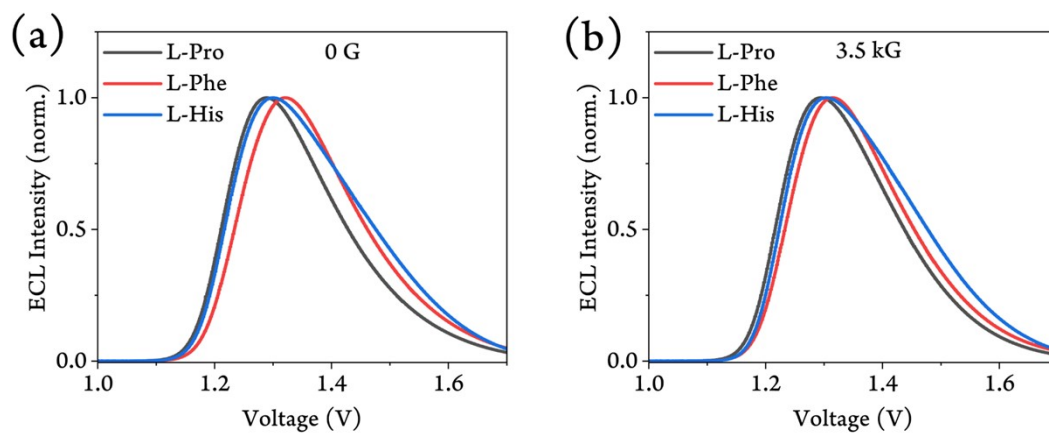


Fig. S12 (a) Electroluminescence versus voltage (ECL-V) curves measured from the electrochemical cell containing 1 mM $\text{Ru}(\text{bpy})_3^{2+}$, 100 mM TPrA, 10-4M amino acids and 0.1 M NaH_2PO_4 under 0 G. Scan rate: 20 mV/s. (b) is the same as (a) but under 3.5 kG.

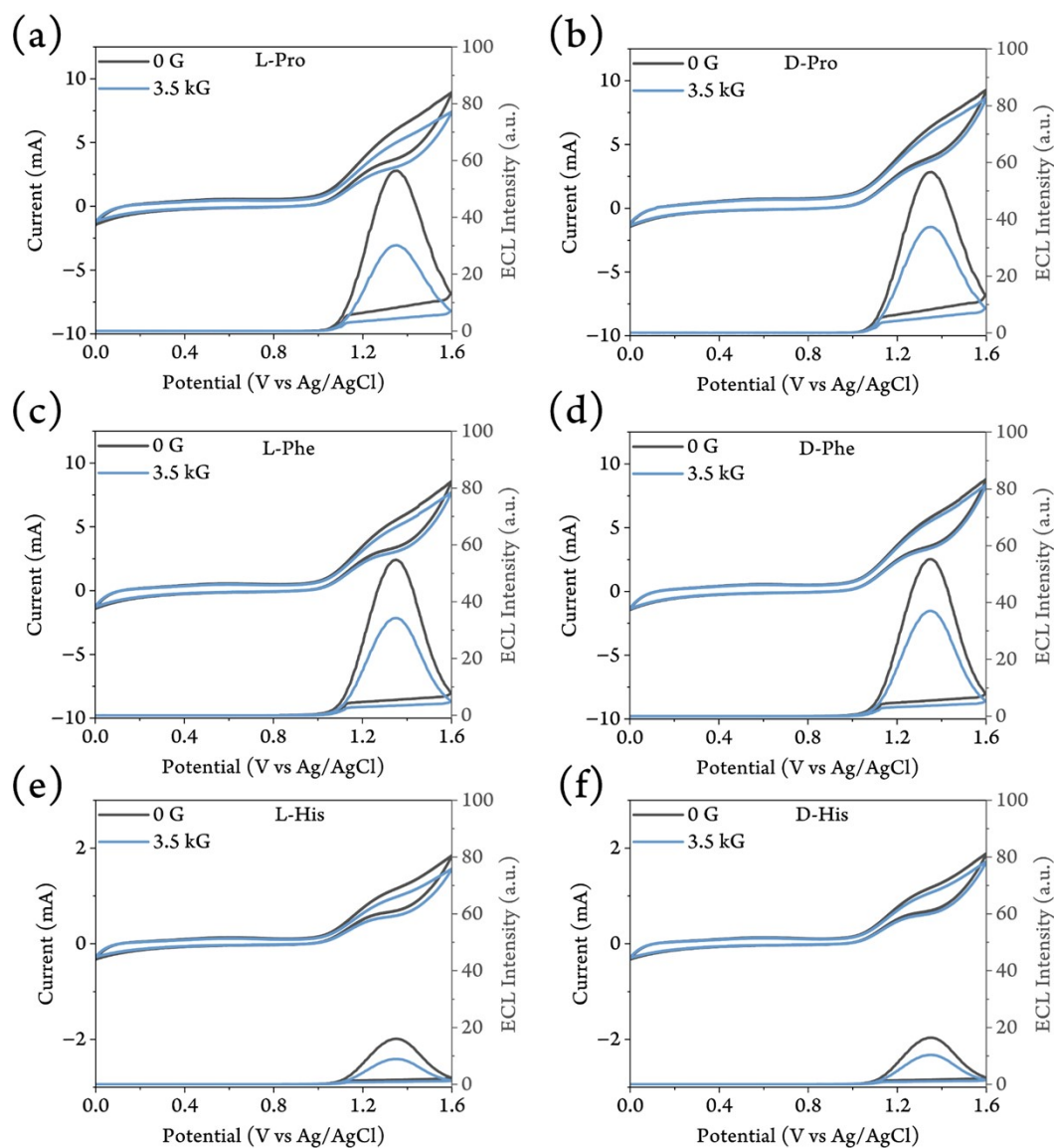


Fig. S13 (a) Cyclic voltametric (CV) and electrochromic luminescence versus voltage (ECL-V) curves measured from the electrochemical cell containing 1 mM $\text{Ru}(\text{bpy})_3^{2+}$, 100 mM TPrA, 10^{-9} M L-Pro and 0.1 M NaH_2PO_4 of magnetic field (0, 3.5 kG). Scan rate: 200 mV/s. (b, c, d, e, f) are the same as (a) but for the D-Pro, L-Phe, D-Phe, L-His, D-His solutions.

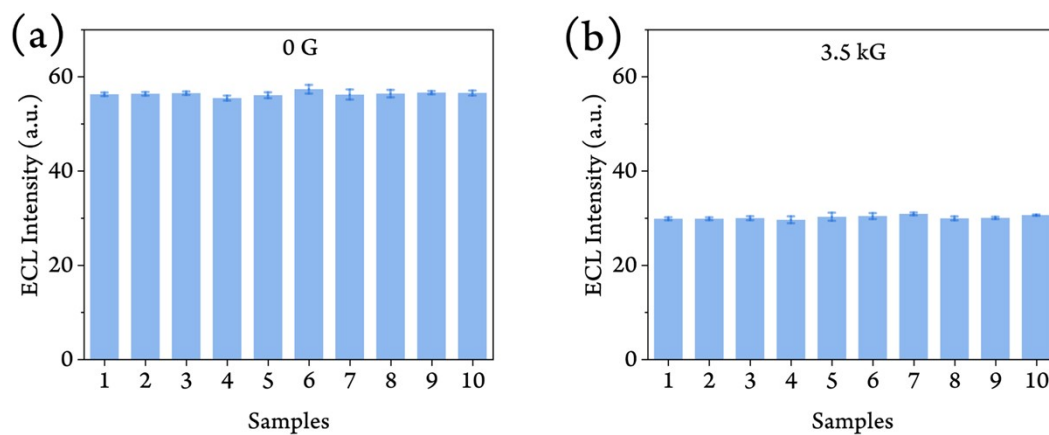


Fig. S14 (a) Reproducibility of the ECL sensor for 10^{-9} M L-Pro detection under a field of 0 G field. The electrolytes containing 1 mM $\text{Ru}(\text{bpy})_3^{2+}$, 100 mM TPrA, and 0.1 M NaH_2PO_4 . Scan rate: 200 mV/s. (b) is the same as (a) but for the field of 3.5 kG field.

Table S1 The ECL Intensity During determination of Amino acids by magneto-electrochemical sensor

Counts	added (mol/L)	ECL Intensity (a.u.)					
		L-Pro	D-Pro	L-Phe	D-Phe	L-Phe	D-Phe
1	1×10^{-9}	29.829	36.588	34.896	37.475	19.388	22.186
2		29.834	36.933	34.957	36.771	19.287	22.051
3		29.957	37.016	34.998	36.779	19.462	22.810
4		29.611	37.644	34.812	36.873	19.500	22.401
5		30.252	36.969	34.928	36.925	19.372	22.720
6		30.403	37.483	34.982	36.518	19.530	22.342
7		30.862	37.762	35.120	36.797	19.545	22.550
8		29.909	38.215	34.264	36.626	19.403	22.607
9		30.018	37.939	34.833	36.816	19.773	22.366
10		30.607	37.402	34.895	37.047	19.480	22.430
11		29.898	37.349	34.871	36.661	19.110	22.109
12		30.809	37.362	34.904	36.338	19.419	22.082
13		30.353	37.491	34.908	36.868	19.246	22.624
14		30.267	37.188	34.942	36.812	19.246	22.399
15		29.797	37.238	35.209	36.892	19.378	22.659
1	1×10^{-4}	31.879	39.568	36.945	38.710	8.683	10.264
2		31.801	39.811	36.319	38.794	8.924	10.325
3		31.862	39.622	36.739	39.269	8.855	10.395
4		31.899	40.048	36.696	38.845	8.742	10.309
5		32.099	39.778	36.878	38.665	8.666	10.284
6		31.784	39.705	36.666	38.536	9.016	10.110
7		31.863	40.221	36.987	38.799	8.596	10.414
8		31.886	40.060	36.926	38.668	8.851	10.306
9		31.888	39.945	36.528	38.956	8.652	10.394
10		32.134	40.063	36.393	38.782	8.745	10.357
11		32.558	39.736	36.352	38.965	8.892	10.214
12		31.858	40.096	36.392	38.867	8.830	10.243
13		31.889	39.283	36.965	38.989	8.636	9.969
14		31.827	39.713	36.742	38.841	8.747	10.312
15		32.156	39.975	36.581	38.905	8.985	10.379

Table S2 Results of Determination of Amino acids Enantiomers with magneto-electrochemical sensor

sample	added (mol/L)	measured (mol/L)	recovery (%)	RSD (% , n=15)
L-Pro	1×10^{-9}	0.996×10^{-9}	99.6	1.28
	1×10^{-4}	1.019×10^{-4}	101.9	1.20
D-Pro	1×10^{-9}	1.024×10^{-9}	102.4	1.03
	1×10^{-4}	1.016×10^{-4}	101.6	0.97
L-Phe	1×10^{-9}	1.003×10^{-9}	100.3	1.10
	1×10^{-4}	9.674×10^{-4}	96.74	1.05
D-Phe	1×10^{-9}	1.007×10^{-9}	100.7	1.04
	1×10^{-4}	9.947×10^{-4}	99.47	0.99
L-His	1×10^{-9}	1.014×10^{-9}	101.4	1.98
	1×10^{-4}	1.066×10^{-4}	106.6	4.38
D-His	1×10^{-9}	1.006×10^{-9}	100.6	1.72
	1×10^{-4}	0.976×10^{-4}	97.6	3.74