Electronic supplementary information (ESI)

Metal-organic complex functionalized protein nanopore sensor for aromatic amino acids chiral recognition

Yanli Guo, Aihua Niu, Feifei Jian, Ying Wang, Fujun Yao, Yongfeng Wei, Lei Tian and Xiaofeng Kang*

Key Laboratory of Synthetic and Natural Functional Molecule Chemistry
College of Chemistry & Materials Science
Northwest University
1 Xuefu Ave., Chang'an District, Xi'an, 710127 (P.R.China)
E-mail: kangxf@nwu.edu.cn

*Corresponding author: Prof. Xiao-feng Kang
College of Chemistry & Materials Science
Northwest University, Xi'an 710069, P. R. China
Fax: +86-029-88302604;
Tel: +86-029-88302604;
E-mail: kangxf@nwu.edu.cn

Supporting Figures and table

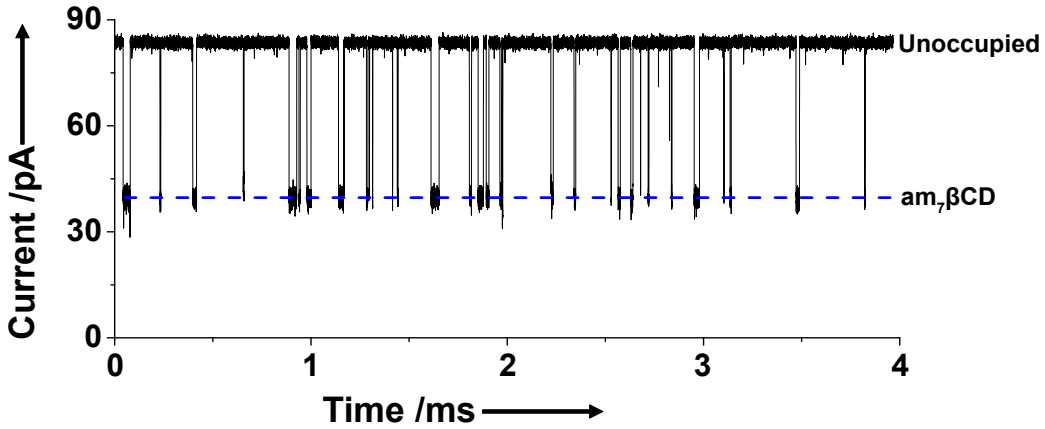

Fig. S1 Representative current traces showing no detectable current block in open and am_7βCD block current levels for a mixture of 20 nature L-α-amino acids (AAS) in $(M113R)_7$ nanopore. Condition: 40 μM am_7βCD added from the trans compartment and a mixture of AAS (20 μM of each L-α-amino acid) from the cis side, 1 M NaCl, 10 mM MOPS, pH 8.0, +100 mV. The same phenomena is for hepta-6-sulfato-βCD (S_7βCD) as an adapter.

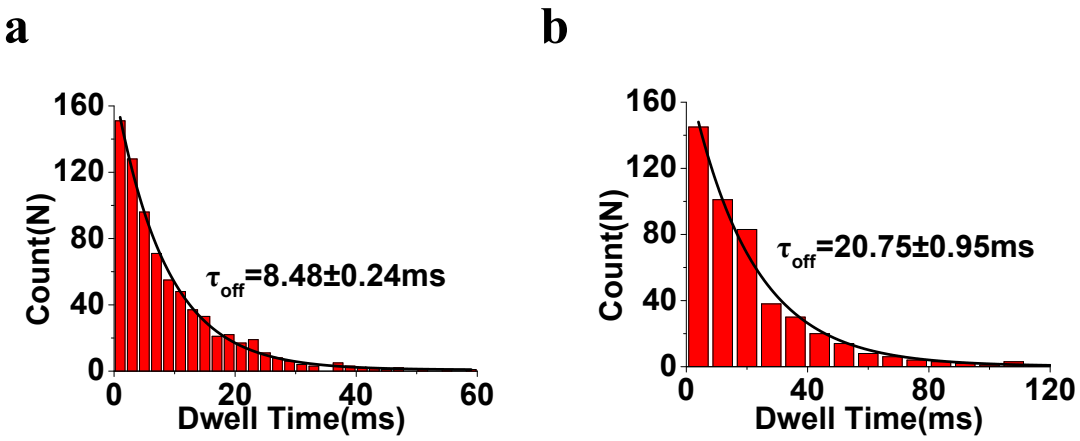

Fig. S2 Dwell-time histograms with exponential fits for the events arising from (a) $am_7\beta CD$ and (b) $am_7\beta CD$-Cu^{II}. Experiment condition: 1 M NaCl, 10 mM MOPS buffer, pH 8.0, +100mV, 40 μM $am_7\beta CD$ and 20 μM $CuCl_2$ added from the trans compartment.

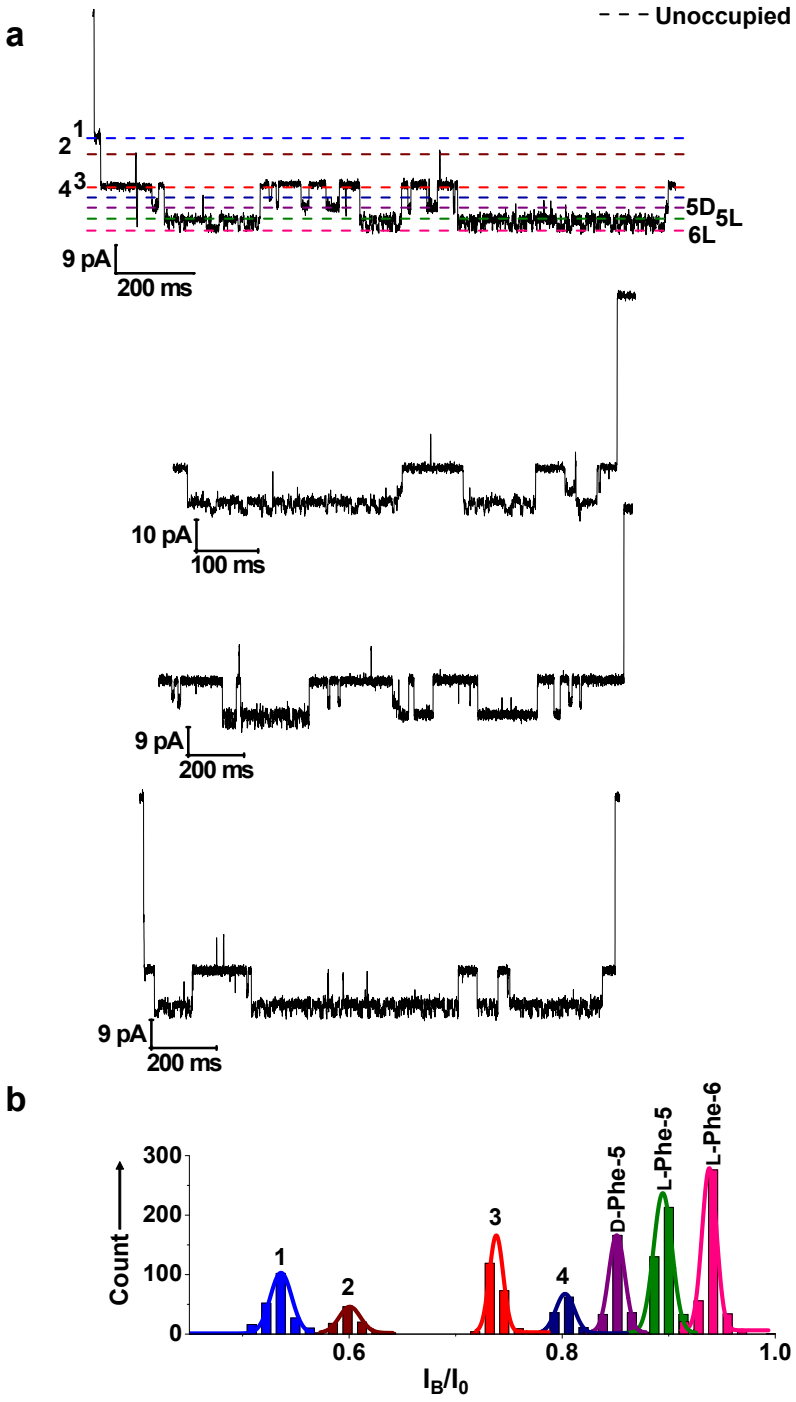

Fig. S3 Representative extensive current traces (a) from single $(M113R)_7$ pore at +100 mV showing the interaction of pore with mixture of L-Phe, D-Phe, $am_7\beta CD$ and $CuCl_2$. (b) The corresponding blockage current event histograms. Experiment condition: 40 μM $am_7\beta CD$ and 20 μM $CuCl_2$ added from the trans compartment and 20 μM L-Phe and 20 μM D-Phe from the cis side, 1 M NaCl, 10 mM MOPS buffer, pH 8.0.

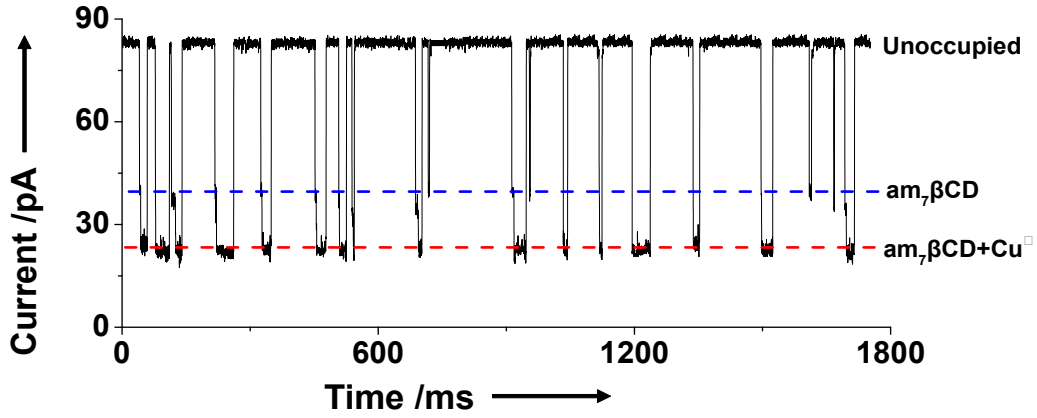

Fig. S4 Representative current traces showing a mixture of L-aliphatic α-amino acids no interaction with cyclodextrin metal complexes in nanopore. Condition: 40 μM am_7βCD and 20 μM $CuCl_2$ added from the trans compartment and L-aliphatic α-amino acids (20 μM for each amino acid.) from the cis side, 1 M NaCl, 10 mM MOPS, pH 8.0, +100 mV.

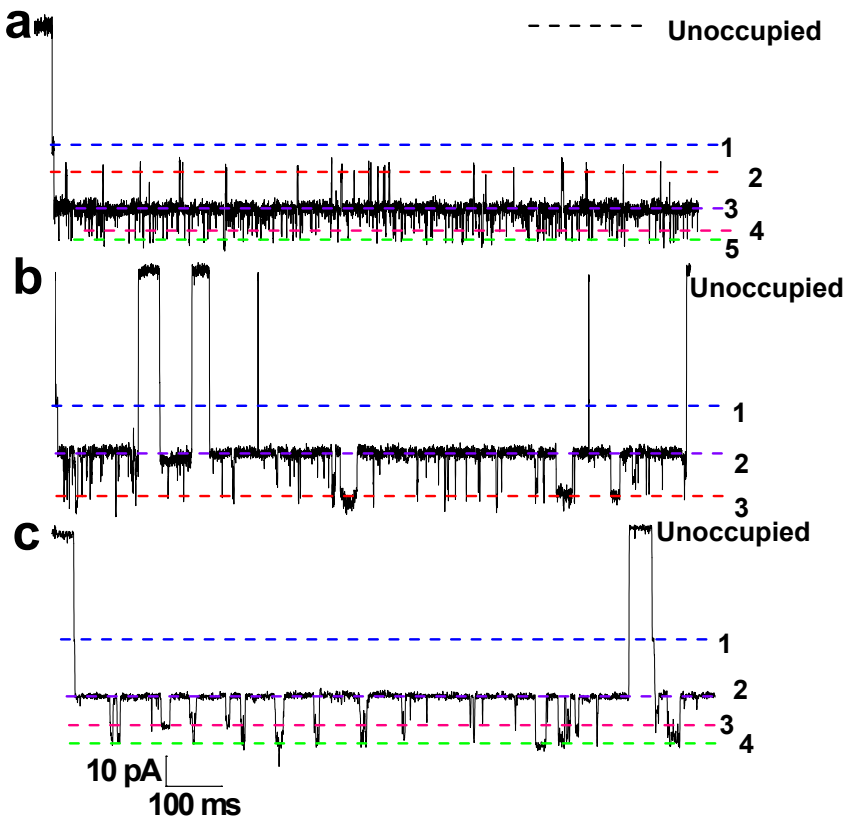

Fig. S5 Representative current traces showing (a) L-dopar (b) 5-sulfosalicylic acid and (c) L-mandelic acid interaction with cyclodextrin metal complexes in nanopore. Condition: 40 μM am$_7$βCD and 20 μM $CuCl_2$ added from the trans compartment and 20 μM for each aromatic compounds from the cis side, 1 M NaCl, 10 mM MOPS, pH 8.0, +100 mV.

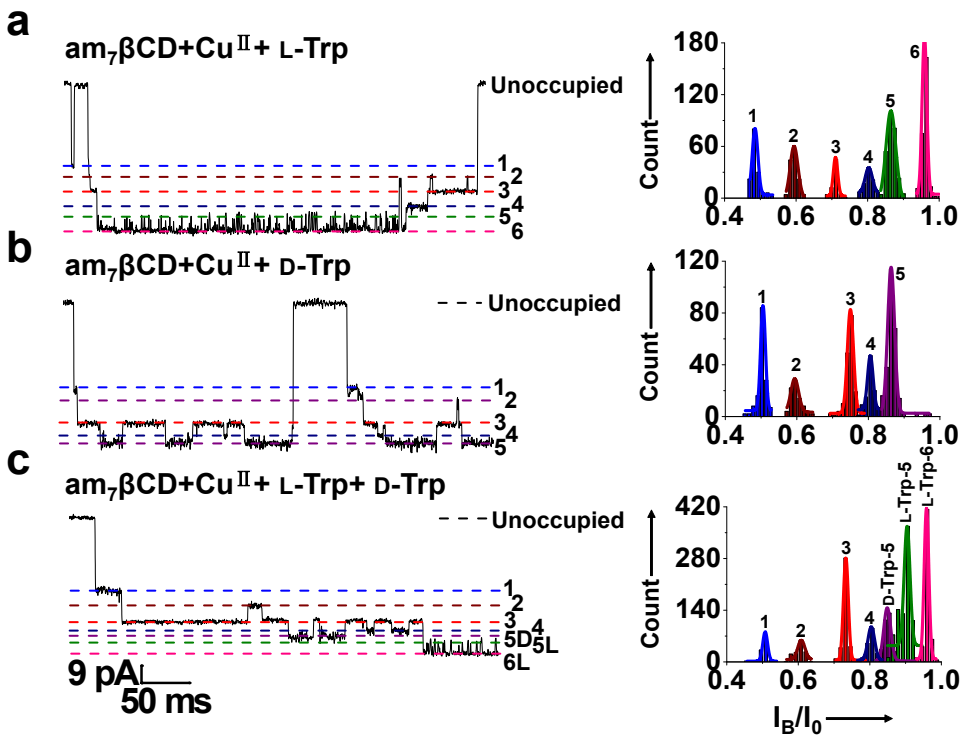

Fig. S6 Interaction of L, D-tryptophan with cyclodextrin metal complexes in $(M113R)_7$ nanopore. Left: representative current traces for (a) L-Trp, $am_7\beta CD$ and $CuCl_2$; (b) D-Trp, $am_7\beta CD$ and $CuCl_2$; (c) L-Trp, D-Trp, $am_7\beta CD$ and $CuCl_2$. Right: the corresponding blockage current event histograms. Condition: 40 μM $am_7\beta CD$ and 20 μM $CuCl_2$ added from the trans compartment and 20 μM L-Trp or (and) 20 μM D-Trp from the cis side, 1 M NaCl, 10 mM MOPS, pH 8.0, +100 mV.

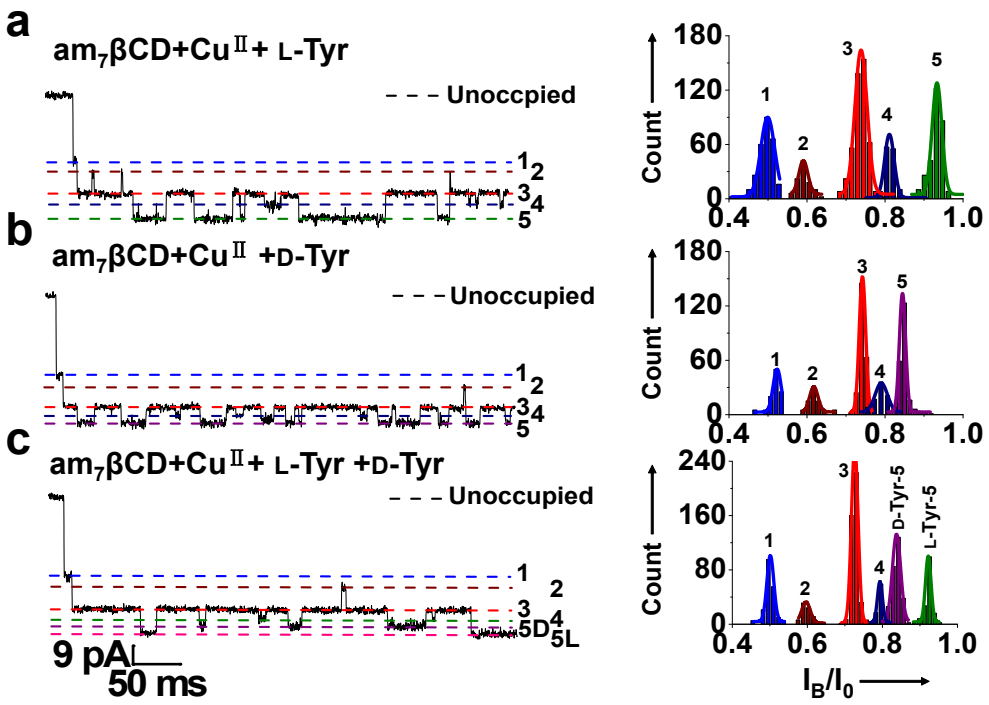

Fig. S7 Interaction of L, D-tyrosine with cyclodextrin metal complexes in $(M113R)_7$ nanopore. Left: representative current traces for (a) L-Tyr, $am_7\beta CD$ and $CuCl_2$; (b) D-Tyr, $am_7\beta CD$ and $CuCl_2$; (c) L-Tyr, D-Tyr, $am_7\beta CD$ and $CuCl_2$. Right: the corresponding blockage current event histograms. Condition: 40 μM $am_7\beta CD$ and 20 μM $CuCl_2$ added from the trans compartment and 20 μM L-Trp or (and) 20 μM D-Trp from the cis side, 1 M NaCl, 10 mM MOPS, pH 8.0, +100 mV.

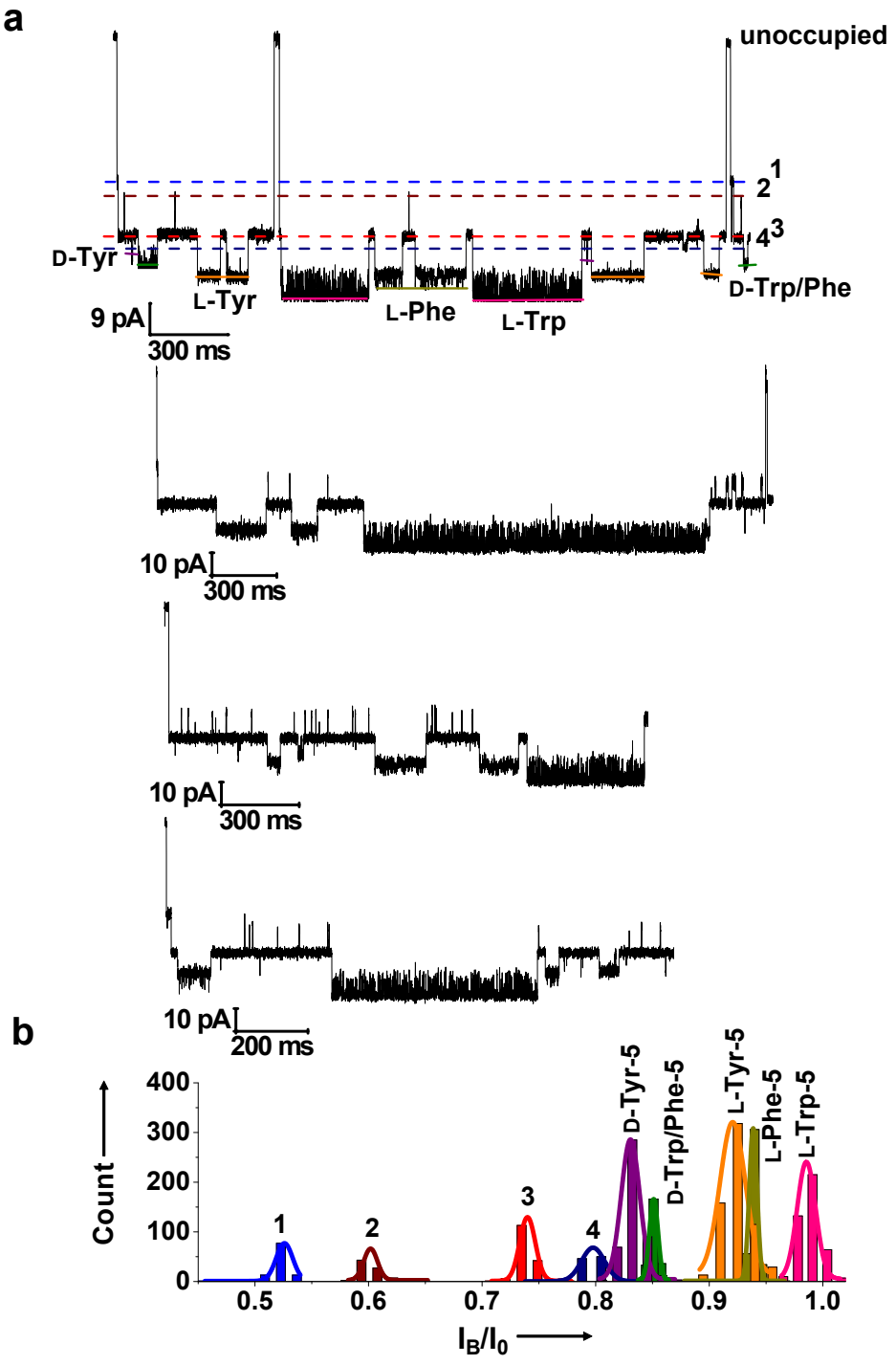

Fig. S8 Extension of the current trace of Figure 3d and the corresponding current event histogram. Condition: 40 μM am$_7$βCD and 20 μM $CuCl_2$ added from the trans compartment and a mixture of L-and D-aromatic amino acids (Phe, Trp and Tyr, 20 μM for each enantiomer) from the cis side, 1 M NaCl, 10 mM MOPS, pH 8.0, +100 mV.

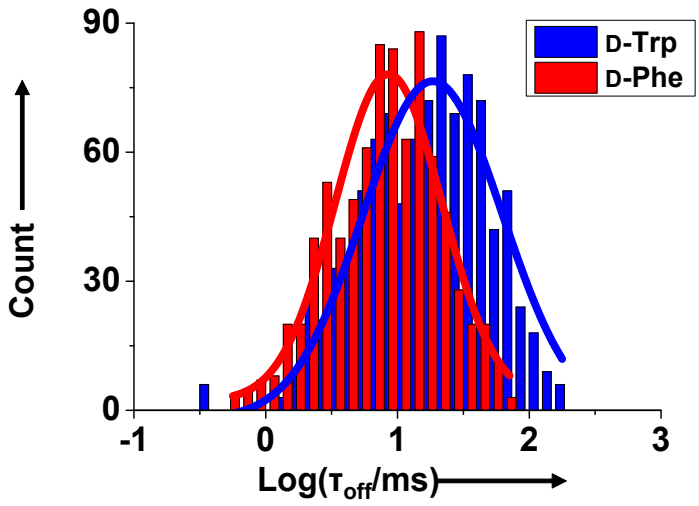

Fig. S9 The histogram of the logarithmically binned dwell time for D-Trp and D-Phe (The corresponding trace see Figure S7). The experiment conditions were the same as in Figure S8.

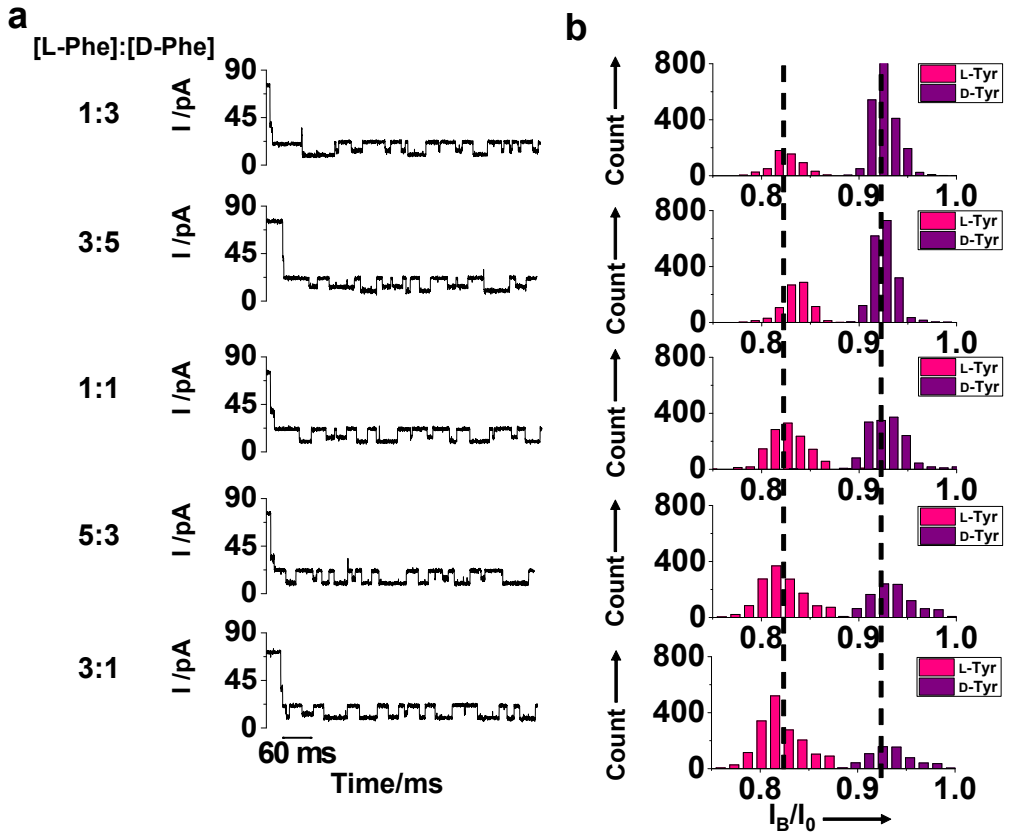

Fig. S10 Nanopore detection of enantiomeric purity in a mixture of L- and D-tyrosine. (a) Representative single channel recordings of 40 μM tyrosine enantiomers at various L- and D-Tyr concentration ratios in the presence of 40 μM am$_7$βCD and 20 μM $CuCl_2$. (b) The corresponding concentration-dependent event amplitude histograms. Condition: am$_7$βCD and $CuCl_2$ added from the trans compartment and L- and D-Tyr from the cis side, 1 M NaCl, 10 mM MOPS, pH 8.0, +100 mV.

Table S1 The *ee* of prepared and measured for the mixtures of L- and D-tyrosine at various concentration ration. The total concentration of Tyr was fixed to 40 μM.

[L-Tyr]:[D-Tyr]	1:3	3:5	1:1	5:3	3:1
ee%(Prepared)	-50.0	-25.0	0	25.0	50.5
ee%(Measured)	-52.3±1.7	-27.5±1.1	-3.1±0.7	25.8±1.4	52.3±2.1