

Supporting Information

A Label-free and enzyme-free system for operating various logic circuits using poly(thymine)-templated CuNPs and SYBR Green I as signal transducers

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Table S1. DNA sequences used in the designed logic operations.

Strands	Sequences (5'- 3')
P-DNA	CCAGA TATTC ACCGG
D ₀	AAAAA AAAAA AAAAA AAAAA AAAAA AAAAA
D ₁	TTTTT TTTTT TTTTT TTTTT TTTTT TTTTT
D ₂	CCGGT GAATA TCTGG
D ₃	CCGGT GAATA TCTGG TTTTT TTTTT TTTTT TTTTT TTTTT TTTTT

To find the available DNA sequences for the developed higher-order logic gates, the designed DNA sequences were firstly mimicked on the website <http://mfold.rna.albany.edu/?q=DINAMelt/TwoState-melting> and then modified according to the experimental results. The above procedures were repeated until the available DNA sequences were obtained.

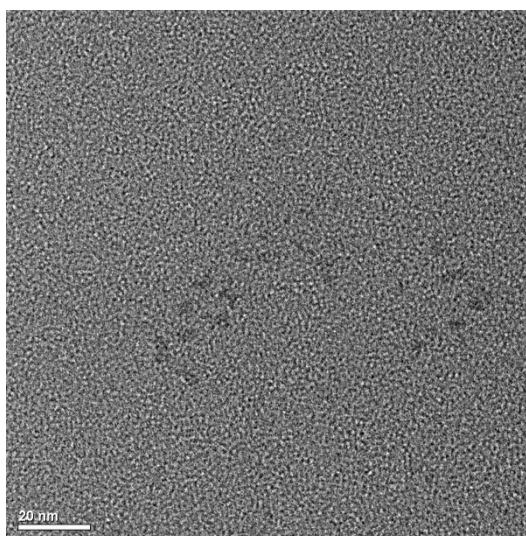


Fig. S1 Representative TEM image of as-synthesized CuNPs using polyT (T30) ss-DNA as template.

The as-synthesized CuNPs was characterized with Transmission electron microscopy (TEM) as shown in Fig. S1. The size of as-synthesized CuNPs was about 4 nm, which is consistent with previous report.¹

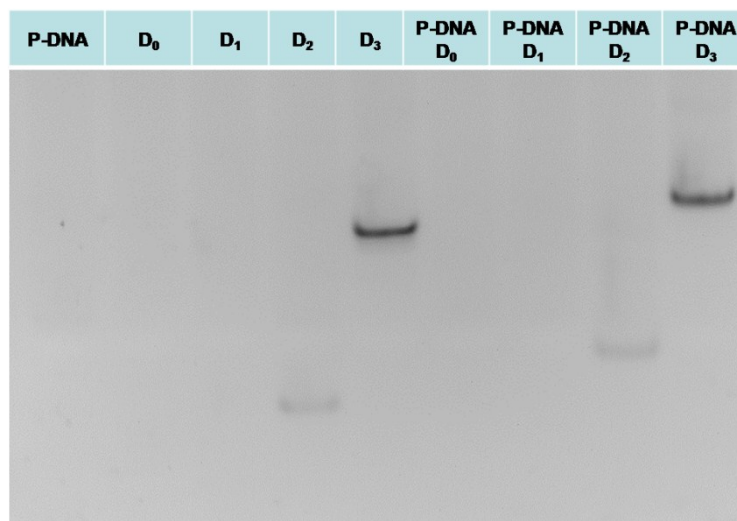


Fig. S2 PAGE analysis of DNA interactions for the 4-to-2 encoder

The first five belts from left indicate the ss-DNAs of P-DNA, D₀, D₁, D₂ and D₃ in sequence. No obvious belts can be found from P-DNA. It maybe attributes to the short length of P-DNA. The same phenomenon appears to D₀ and D₁ since these two poly-DNA strands cannot form any secondary structures, resulting in low binding affinity to the ds-DNA dyes used for the PAGE analysis. In the coexistence of P-DNA/D₀ or the coexistence of P-DNA/D₁, no belt appears at new position, suggesting no hybridization reaction happens. Belts appear at new positions in the presence of P-DNA/D₂ and P-DNA/D₃, indicating the formation of the corresponding duplex.

References

1. Z. Qing, X. He, D. He, K. Wang, F. Xu, T. Qing and X. Yang, *Angew. Chem.Int. Ed.*, 2013, **52**, 9719-9722.