Electronic Supplementary Information

Synthesis of 2,2'-Biimidazole-Based Platinum(II) Polymetallaynes and Tuning Their Fluorescent Response Behaviors to Cu^{2+} Ions Through Optimizing the Configuration of the Organic Spacers and Steric Effect

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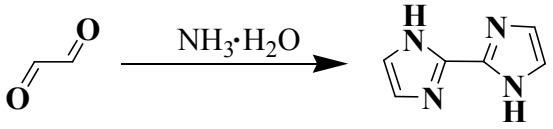
Synthesis of 2,2'-Biimidazole. To the solution of glyoxal (25 mL, 40%), the concentrate ammonia (30 mL, *ca.* 28%) was added slowly in about 0.5 h. After addition, the reaction was stirred for 5 h. The brown precipitate was collected by filtration and washed with water (20 mL). The crude product was recrystallized with ethylene glycol. The hot ethylene glycol solution was carefully poured into a beaker. After cooling to room temperature, the formed needle crystals were collected and washed with ethanol (30 mL). The 2,2'-biimidazole was obtained in *ca.* 45% yield. ^{1}H NMR (400 MHz, DMSO-d_6): δ (ppm) 12.67 (s, br, 2H), 7.14 (s, 1H), 7.10 (s, 1H).



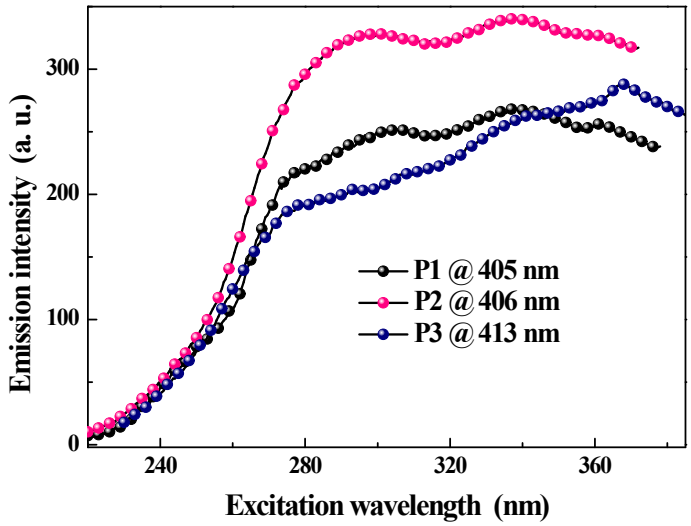


Figure S1. The excitation spectra for these polymetallaynes in THF at 293 K.

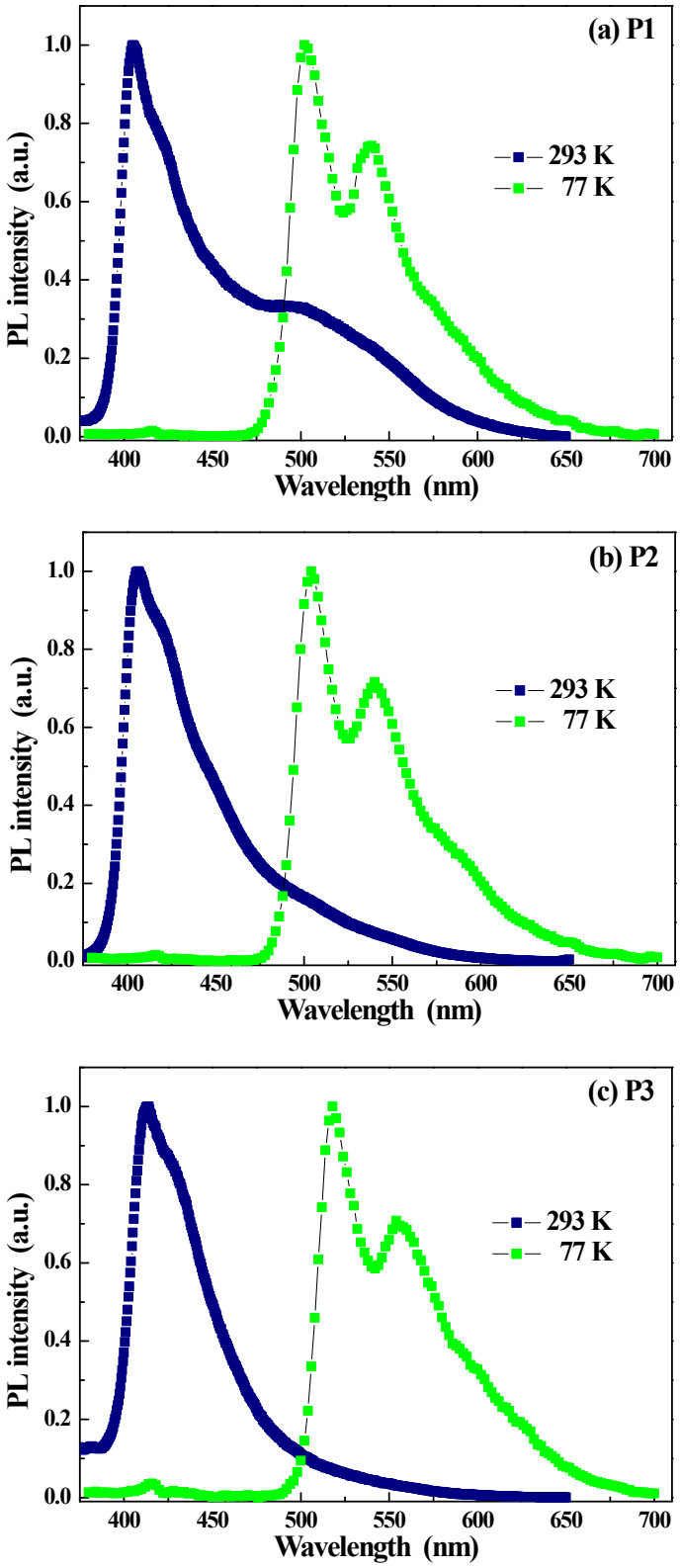


Figure S2. The emission spectra for the 2,2'-biimidazole-based polymetallaynes in THF at 293 K and 77K.

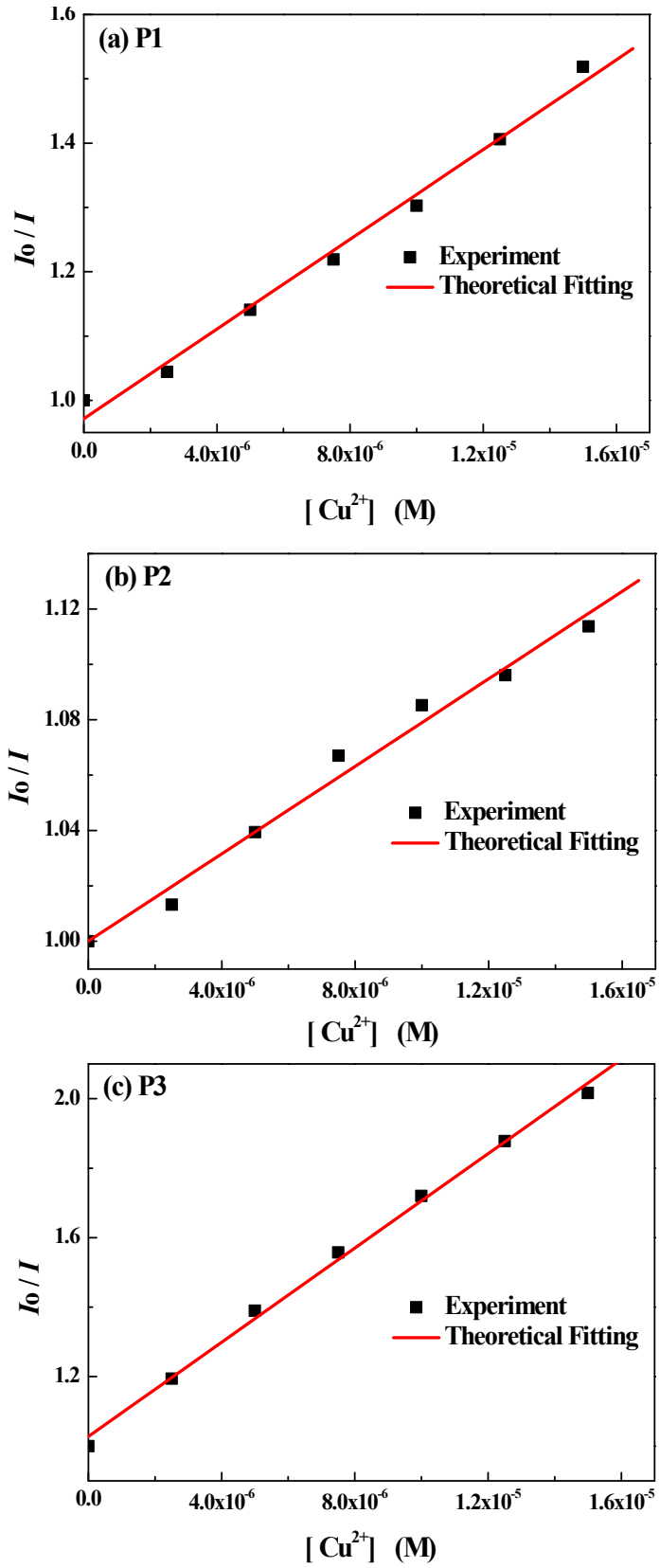


Figure S3. The fitting results for the K_{sv} based on the fluorescence titration results.

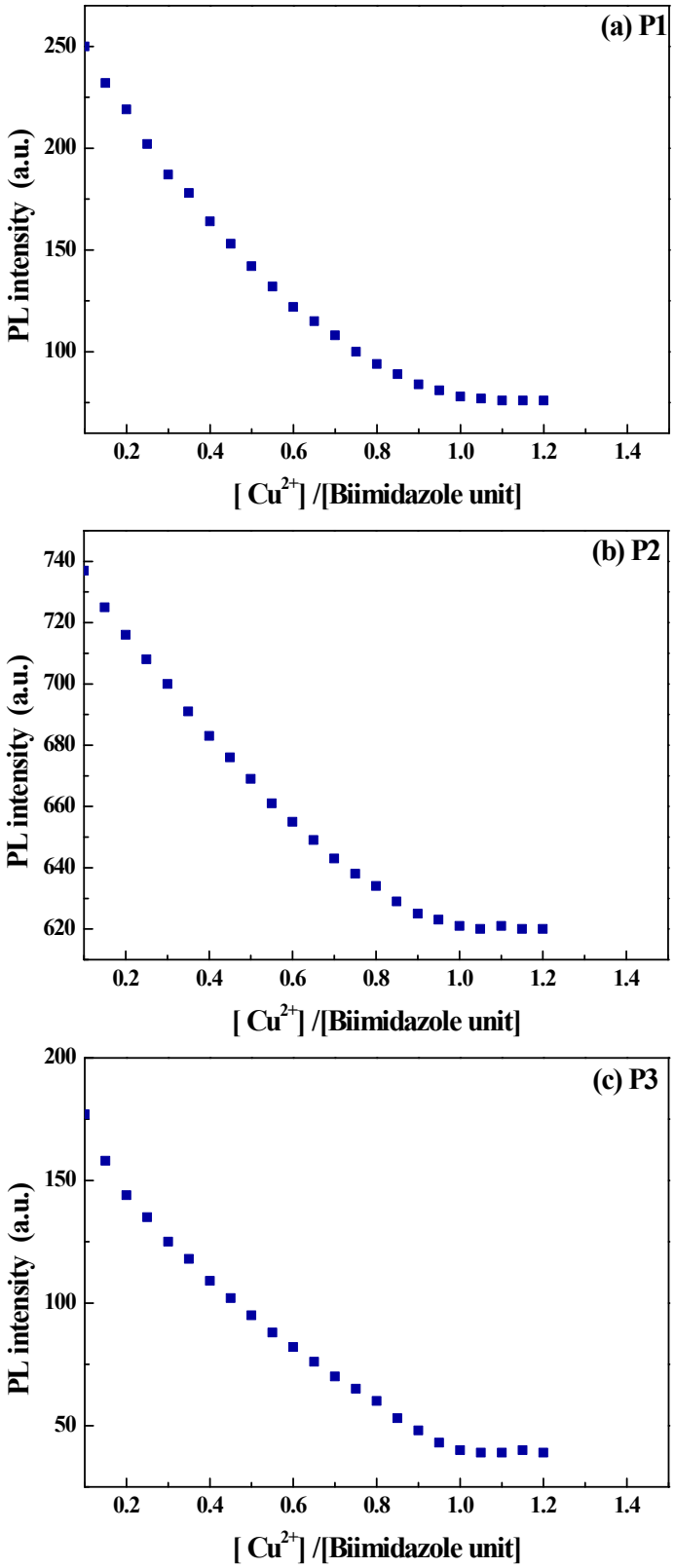


Figure S4. The titration plots for the Cu^{2+} sensing processes of the 2,2'-biimidazole-based polymetallaynes in THF.

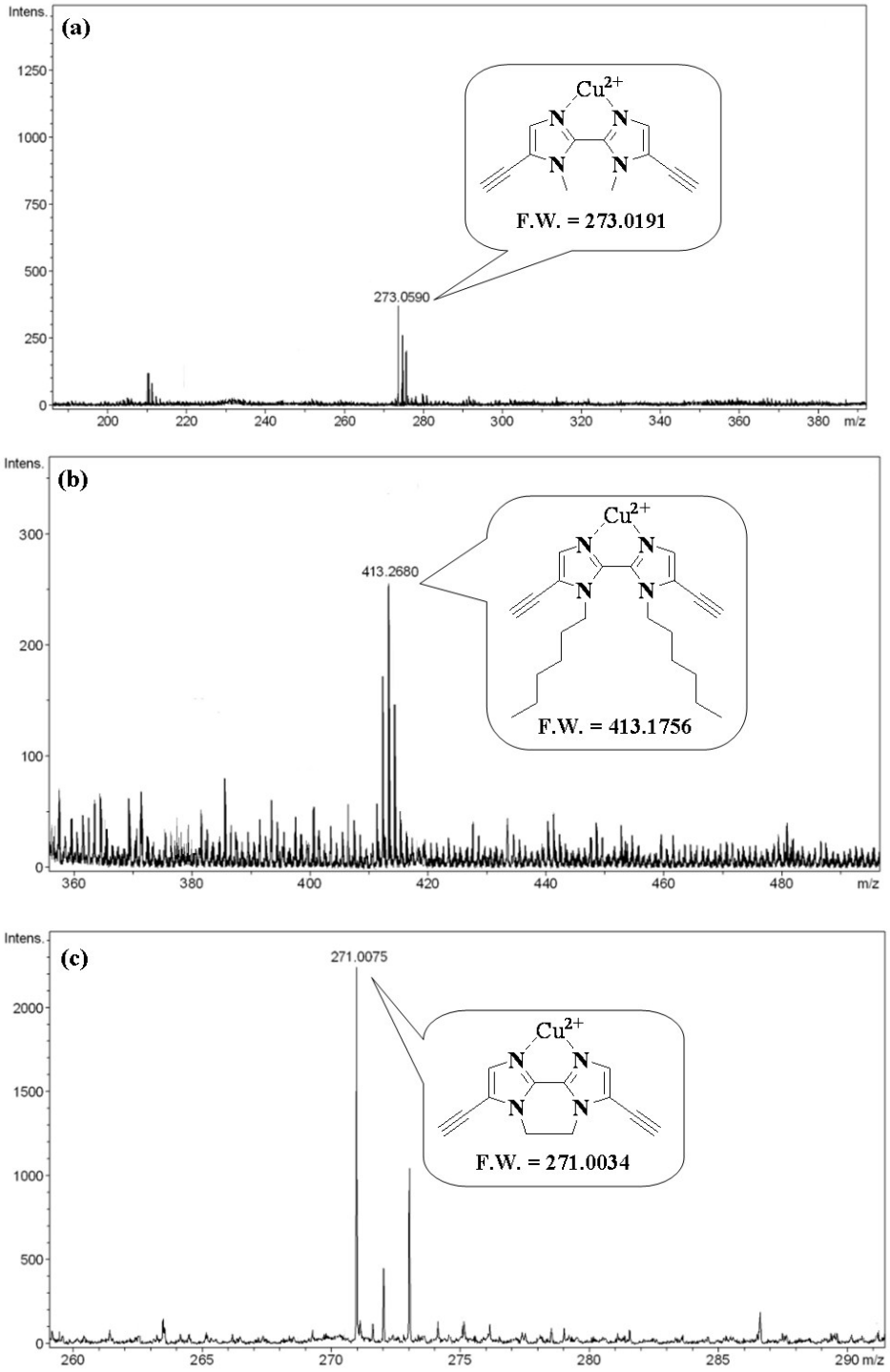


Figure S5. The mass spectra for the possible adducts between the Cu^{2+} ions and organic ligands.

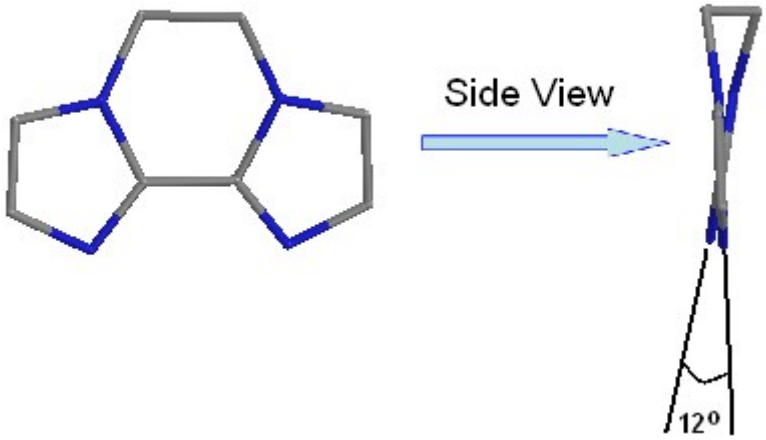


Figure S6. The arrangement of the two imidazole rings in the 2,2'-biimidazole units with optimized configuration in **P3**.

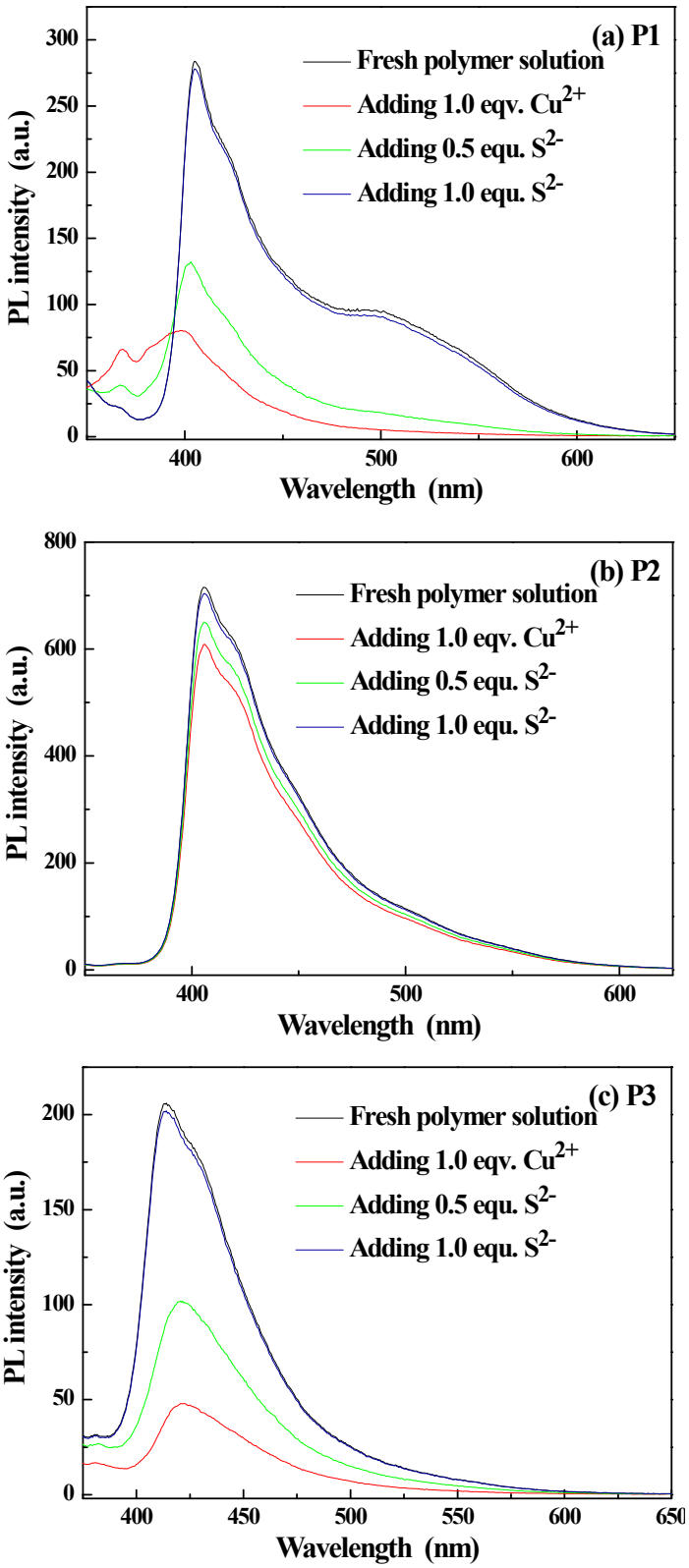


Figure S7. The emission turn-on behaviors by S^{2-} anions of the 2,2'-biimidazole-based polymetallaynes in THF.

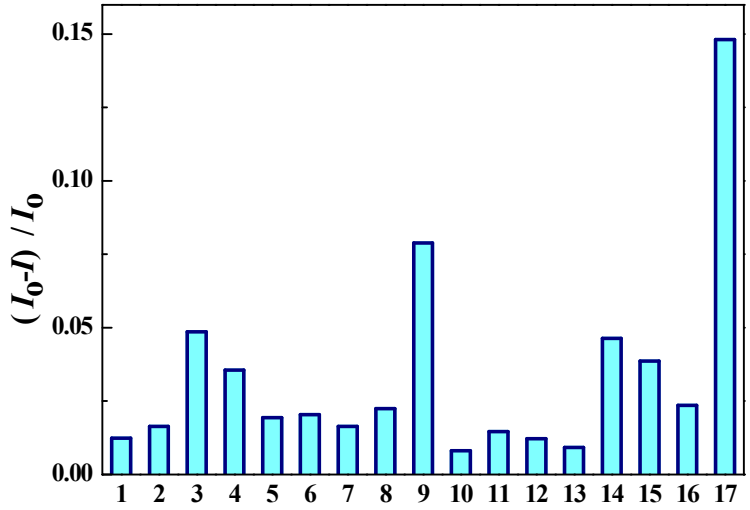


Figure S8. The selectivity of the fluorescent signal of the **P2** to the Cu^{2+} ions (***I***: The fluorescent signal intensity after adding 1.2 equivalent of different ion; $\boldsymbol{I_0}$: The fluorescent signal intensity before adding ions).**1**: Ag^{+}, **2**: Zn^{2+}, **3**: Fe^{3+}, **4**: Ni^{2+}, **5**: Na^{+}, **6**: Mn^{2+}, **7**: Mg^{2+}, **8**: K^{+}, **9**: Co^{2+}, **10**: Hg^{2+}, **11**: Cd^{2+}, **12**: Ca^{2+}, **13**: NH_4^{+}, **14**: Ru^{3+}, **15**: Ir^{3+}, **16**: Rh^{3+}, **17**: Cu^{2+}.