Supporting Information for

Network Formation and Photoluminescence in Copper(I) Halide Complexes with Substituted Piperazine Ligands

Jason P. Safko, a Jacob E. Kuperstock, a Shannon M. McCullough, a Andrew M. Noviello, a
Xiaobo Li, b James P. Killarney, b Caitlin Murphy, b Howard H. Patterson, b Craig A.
Bayse, c and Robert D. Pike a*

aDepartment of Chemistry, College of William and Mary, Williamsburg, VA 23187-8795.
bDepartment of Chemistry and Biochemistry, Old Dominion University, Norfolk, VA 23529.
cDepartment of Chemistry, University of Maine, Orono, ME 04469-5706.

Email: rdpike@wm.edu
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Figure S1. Experimental and calculated powder diffractograms of (CuBr)$_4$(I)$_2$. 

(CuBr)$_2$(1)
Figure S2. Experimental and calculated powder diffractograms of CuI + 1 products.

(CuI)$_4$(1)$_n$

- Experimental, $n = 2$
- Calculated, $n = 3$
Figure S3. Experimental and calculated powder diffractograms of (CuBr)$_4$(2)$_2$. 

![Diagram showing experimental and calculated powder diffractograms of (CuBr)$_4$(2)$_2$.](image-url)
Figure S4. Experimental and calculated powder diffractograms of (CuI)$_4$(2)$_2$. 
Figure S5. Experimental and calculated powder diffractograms of (CuI)$_2$(3).
Figure S6. Experimental and calculated powder diffractograms of \((\text{CuI})_2(4)\).
Figure S7. Experimental and calculated powder diffractograms of (CuI)$_2$(5).
Figure S8. Experimental and calculated powder diffractograms of (CuI)$_4$(6)$_4$. 
Figure S9. Experimental and calculated powder diffractograms of (CuI)$_2$(7).
Figure S10. Experimental and calculated powder diffractograms of (CuI)$_2$(8)$_2$.

Figure S11. X-ray powder diffraction comparison of unreacted (CuI)$_2$(3) (black trace), (CuI)$_2$(3) stirred in 5% Py/toluene for two hours (red trace), and (CuI)$_4$Py$_4$ (blue trace), showing the conversion of (CuI)$_2$(3) to (CuI)$_4$Py$_4$ on exposure to Py.
Figure S12. TGA for (CuI)$_2$(1)$_2$.

Figure S13. TGA for (CuBr)$_2$(2)$_2$. 
Figure S14. TGA for (CuI)$_4$(2)$_2$.

Figure S15. TGA for (CuI)$_2$(3).
Figure S16. TGA for (CuI)$_2$(4).

Figure S17. TGA for (CuI)$_2$(5).
Figure S18. TGA for (CuI)$_4$(6)$_4$.

Figure S19. TGA for (CuI)$_2$(7).
Figure S20. TGA for (CuI)$_2$(8)$_2$. 

Sample: (CuI)$_2$(DiPhMe$_2$PyMe-Pip) 
Size: 5.2600 mg 
Method: Hi-Res - Dynamic 

File: C:\(CuI)$_2$(DiPhMe$_2$PyMe-Pip).003 
Operator: JPS 
Run Date: 18-Nov-2011 14:06 
Instrument: TGA Q500 V6.7 Build 203 

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Figure S21. Luminescence spectra of (CuI)$_4$(1)$_2$ at 298 and 77 K.

Figure S22. Luminescence spectra of (CuBr)$_4$(2)$_2$ at 298 and 77 K.
Figure S23. Luminescence spectra of (CuI)$_4$(2)$_2$ at 298 and 77 K.

Figure S24. Luminescence spectra of (CuI)$_2$(3) at 298 and 77 K.
Figure S25. Luminescence spectra of (CuI)$_2$(4) at 77 K. (Compound lacks luminescence at 298 K.)

Figure S26. Luminescence spectra of (CuI)$_2$(5) at 298 and 77 K.
Figure S27. Luminescence spectra of (CuI)$_4$(6)$_4$ at 298 and 77 K.

![Luminescence spectrum of (CuI)$_4$(6)$_4$](image)

Figure S28. Luminescence spectra of (CuI)$_2$(7) at 298 and 77 K.

![Luminescence spectrum of (CuI)$_2$(7)](image)
Figure S29. Luminescence spectra of (CuI)$_2$(8)$_2$ at 298 and 77 K.
Figure S30. Plots of the cluster-based molecular orbitals of \((\text{CuI})_2(\text{NMe}_3)_2\) (Y).