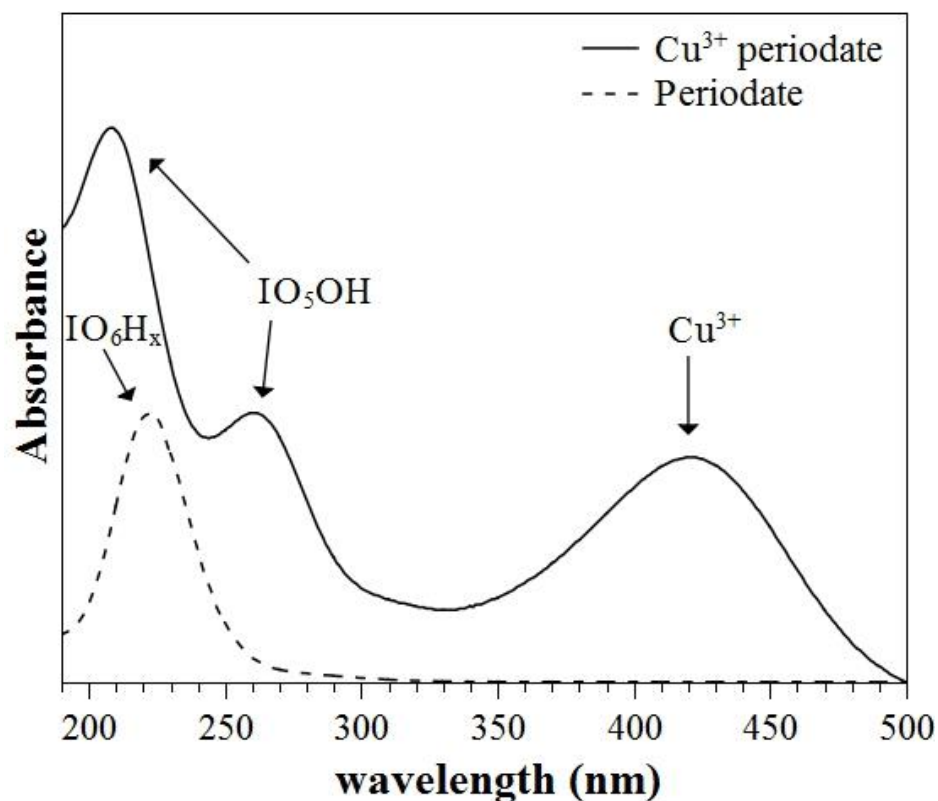
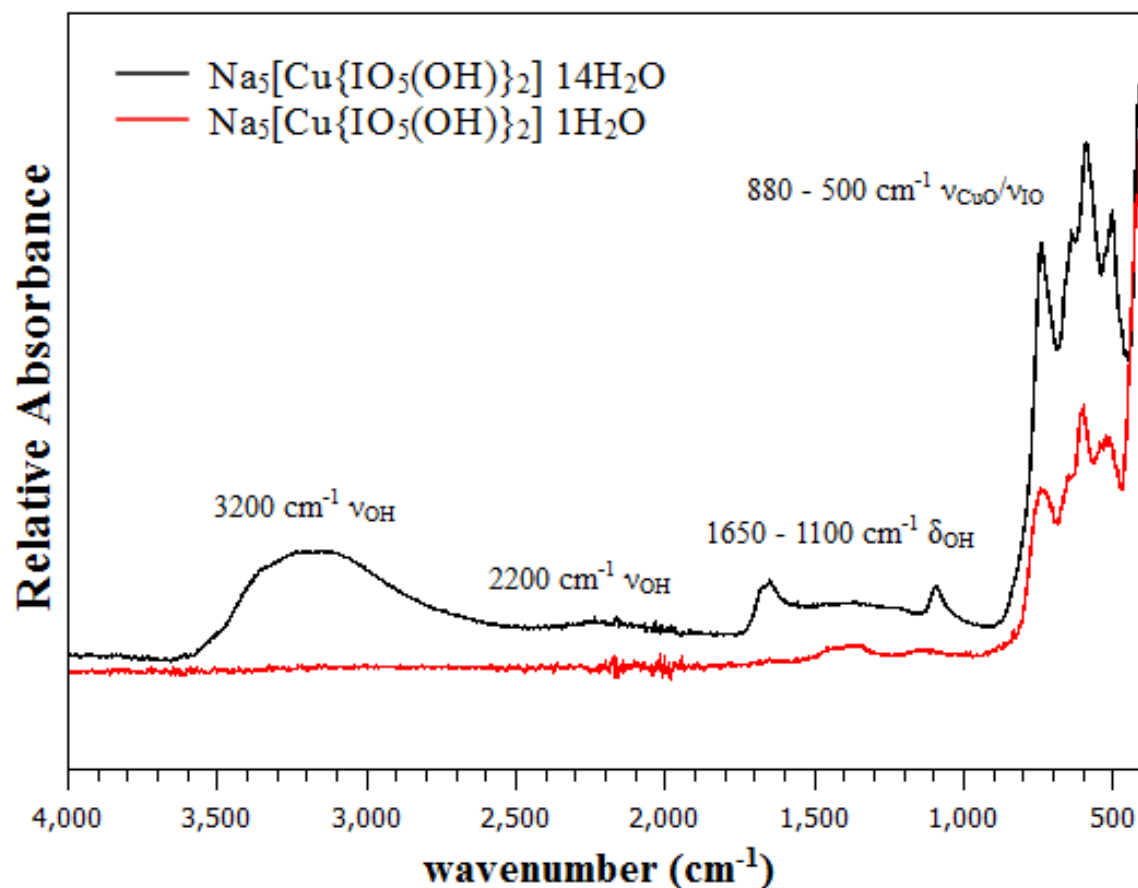


Supporting Information

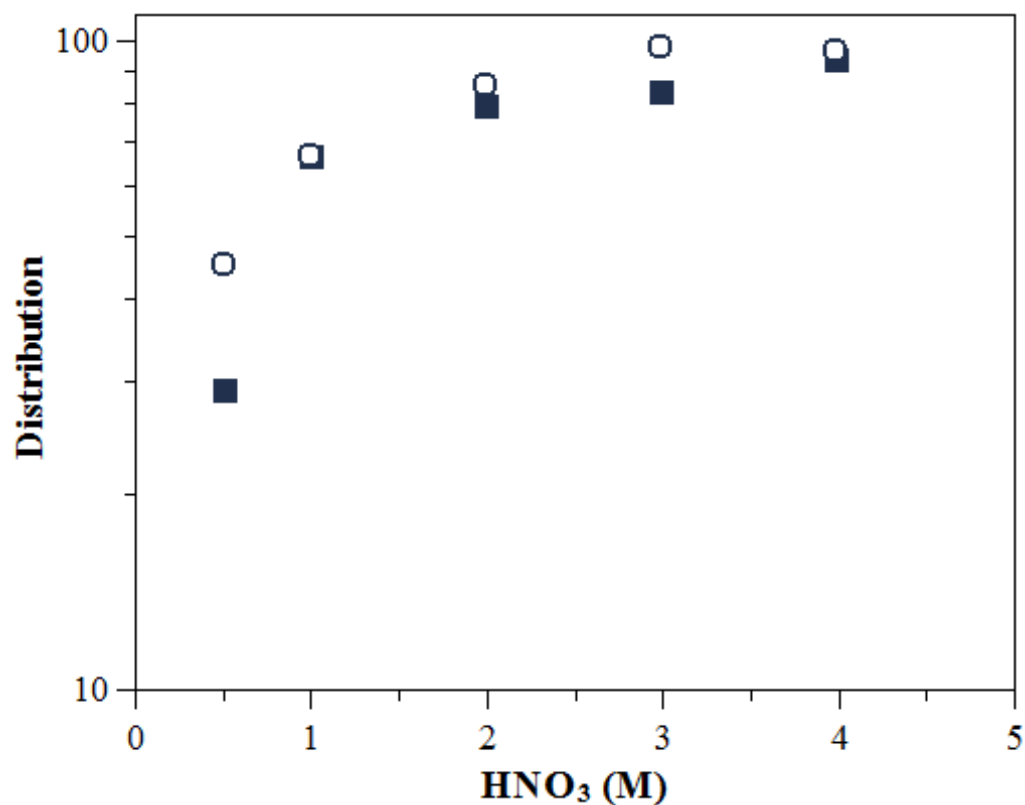
ASSOCIATED CONTENT Supporting Info Figures



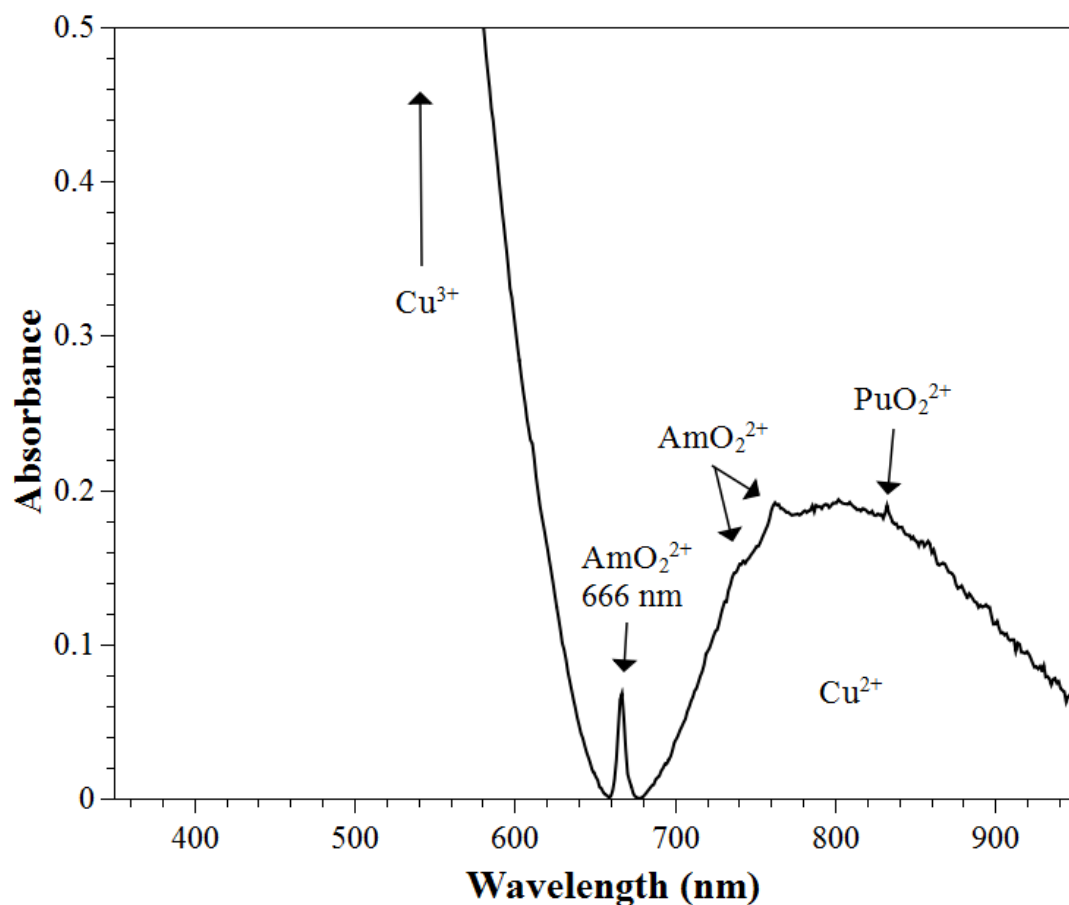
SI Figure 1: Characteristic spectra of Cu^{3+} periodate in 18 MΩ H_2O . Peaks match those listed in literature as Cu^{3+} at 420 nm and complexed periodate at 261 and 210 nm (solid line).^{1,2} Sodium periodate is presented (dashed line) as an uncomplexed ligand in 18 MΩ H_2O for reference. The shift in free periodate to higher wavelength (lower energy) indicates a ligand to metal charge transfer.



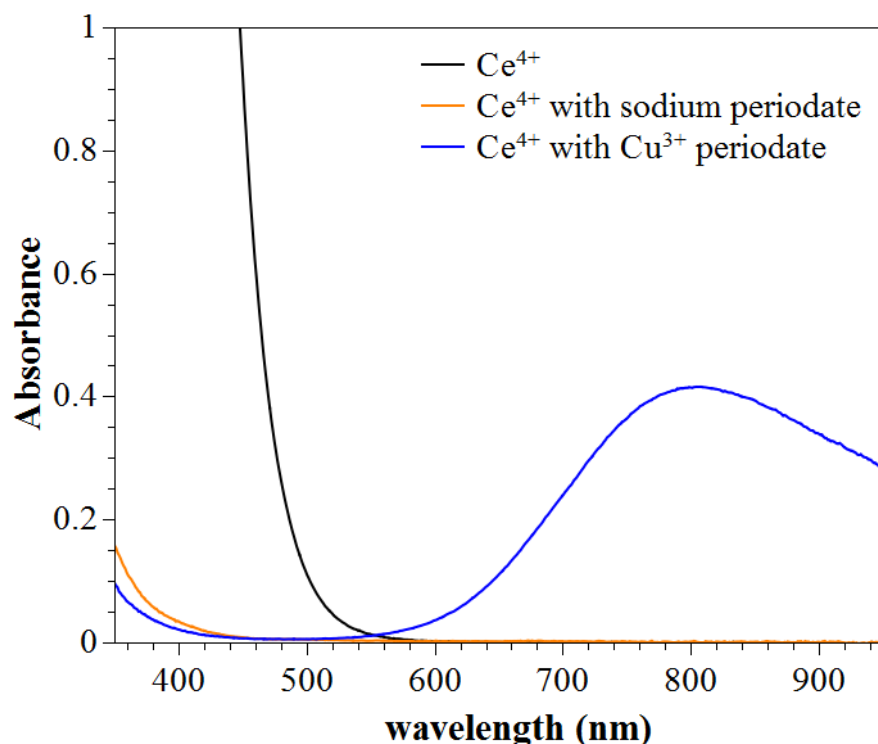
SI Figure 2: FTIR of Cu^{3+} periodate with 7.1% Cu ($\text{Na}_5[\text{Cu}\{\text{IO}_5(\text{OH})\}_2] \cdot 14\text{H}_2\text{O}$ 7.37% Cu) (black) and 9.86% Cu ($\text{Na}_5[\text{Cu}\{\text{IO}_5(\text{OH})\}_2] \cdot 1\text{H}_2\text{O}$ 9.86% Cu) (red). The spectra show characteristic peaks of Cu^{3+} complexed with periodate indicated by the metal-iodine-oxygen stretches between 800 and 400 wavenumbers.³ There is a noticeable lack of OH peaks at 3200 cm^{-1} in the 9.86% Cu complex, and indicates very little to no water is present in the crystal structure. However, OH bending vibrations are still present at lower wavelengths due to the presence of I-OH in the metal complex.



SI Figure 3: Distribution of ^{233}U from 0.5 M to 5 M HNO_3 and 1 M DAAP in n-dodecane in the presence (square) and absence (circle) of Cu^{3+} periodate. For the extraction, 500 μL of optima nitric acid solution as added to 20 mg of Cu^{3+} periodate followed by 500 μL of 1 M DAAP in n-dodecane. The vial was shaken for 5 seconds followed by a 30 second centrifuge. Each phase was counted using a Packard Tri-Carb 2500 Liquid Scintillation Counter. Values are reported as mean of triplicate samples with less than 15% relative standard deviation.



SI Figure 4: UV-Visible spectrum of 3.0 mM Am in 1 M HNO₃ with 20 mg of Cu³⁺ periodate. Due to ²⁴¹Am high specific activity, ²⁴³Am was used for the UV-Vis analysis, and the spectrum was collected using a Spectral 420 CCD Array UV-Vis Spectrometer. The sharp peak at 666 nm is indicative of AmO₂²⁺. The Cu³⁺ periodate is present as indicated by the large shoulder below 660 nm. The spectrum is consistent with spectra presented by Sinkov et. al.⁴



SI Figure 5: The UV-Vis spectra of 15 mM $\text{H}_2\text{Ce}(\text{NO}_3)_6$ in 3 M HNO_3 (black). Addition of 20 mg Cu^{3+} periodate caused a light yellow to white precipitate to form. The solution was centrifuged prior to recollecting a UV-Vis spectra. The results show the amount of Ce^{4+} dropped significantly, and there was an ingrowth of Cu^{2+} from reduction of Cu^{3+} (blue). Similarly, addition of 20 mg sodium periodate resulted precipitate formation and a decrease of the Ce^{4+} signal in the UV-Vis spectrum (orange).

References:

- (1) Balikungeri, A.; Pelletier, M.; Monnier, D. Contribution to the Study of the Complexes Bis (dihydrogen Tellurato) cuprate(III) and Argentate (III), Bis (hydrogen Periodato) Cuprate (III) and Argentate (III). *Inorganica Chim. Acta* **1977**, 22, 7–14.
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- (3) Dengel, A. C.; Griffith, W. P.; Mostafa, S. I.; White, A. J. . Raman and Infrared Study of Some Metal Periodato Complexes. *Spectrochim. Acta Part A Mol. Spectrosc.* **1993**, 49 (11), 1583–1589.
- (4) Sinkov, S. I.; Lumetta, G. J. Americium(III) Oxidation by copper(III) Periodate in Nitric Acid Solution as Compared with the Action of Bi(V) Compounds of Sodium, Lithium, and Potassium. *Radiochim. Acta* **2015**, 103 (8), 541–552.