Electronic Supplementary Material (ESI) for Green Chemistry.

Direct Extraction of Copper from Copper Sulfide Minerals using Deep Eutectic Solvents

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Supplementary Information:

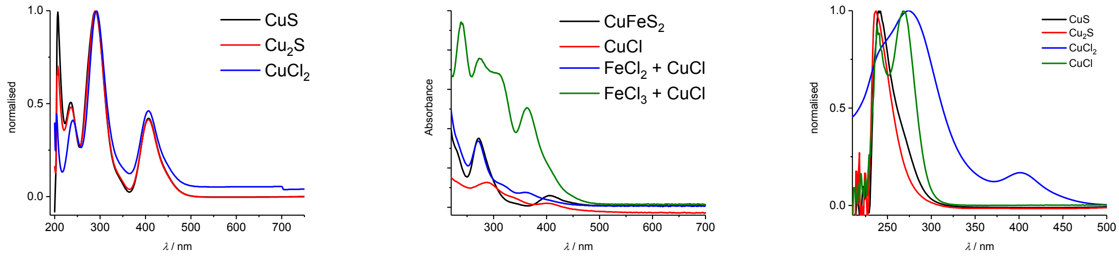

Figure S1: UV-vis comparisons of Cu-species in 1ChCl:2EG (left), identification of species in leached chalcopyrite (middle), and Cu-species in 1ChCl:2U (right).

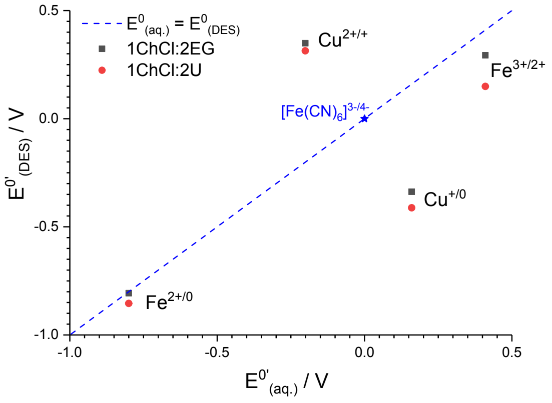

Figure S2: Graph showing the formal electrode potentials for copper and iron in 1ChCl:2EG and 1ChCl:2U.

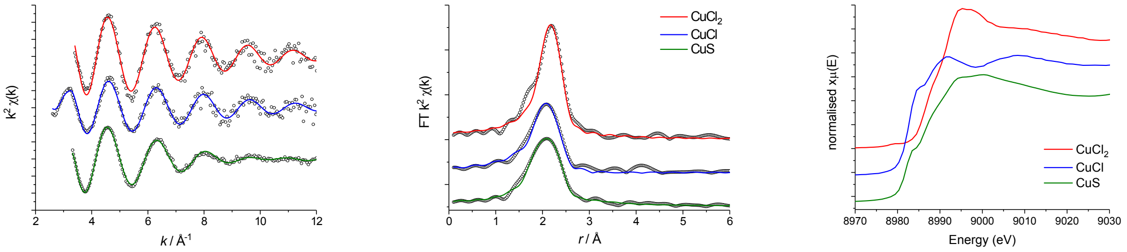

Figure S3: EXAFS, Fourier transforms, and XANES of $CuCl_2$, CuCl, and CuS in 1ChCl:2U. In 1ChCl:2U the CuS is more closely related to CuCl than $CuCl_2$.

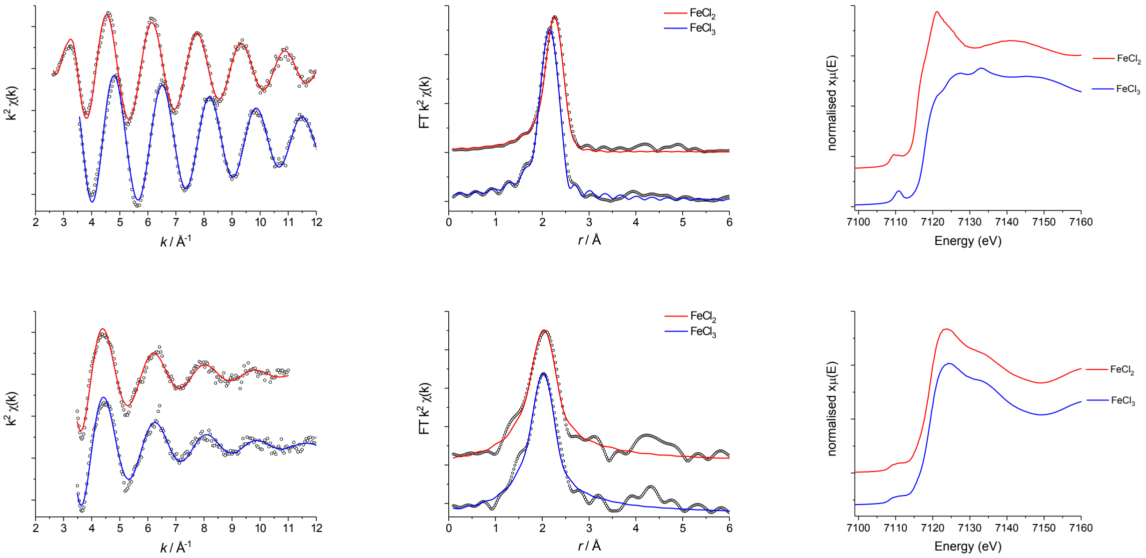

Figure S4: EXAFS, Fourier transforms, and XANES of Fe chlorides in 1ChCl:2EG (top) and 1ChCl:2U (bottom). In 1ChCl:2EG both species are tetrachloride, with different oxidation states. In 1ChCl:2U both species are urea-complexed, with the same oxidation states.

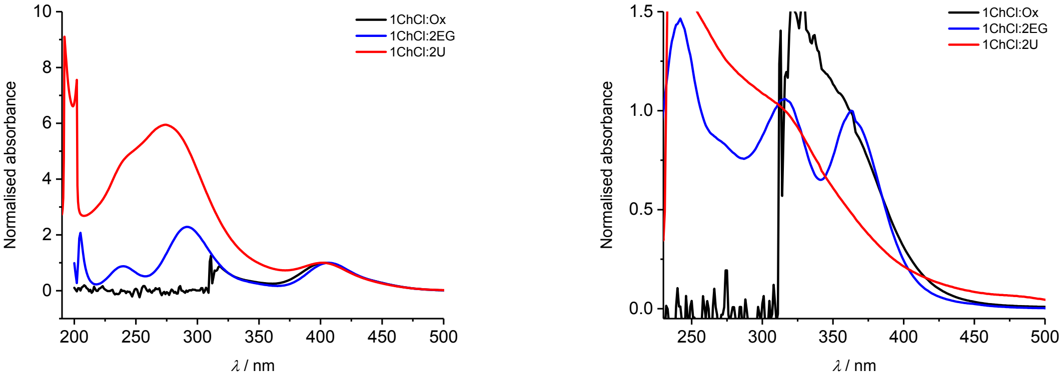

Figure S5: Normalised UV-vis spectra of $CuCl_2$ (left) and $FeCl_3$ (right) in the three different DESs, showing that speciation remains similar for copper but changes substantially for iron.