# Investigating Greener Sustainable Solventless Reaction by Mechanical Grinding vs Solvent-Mediated Schlenk Line Synthesis of New Copper(I) Halides Complexes with Diamine Ligands

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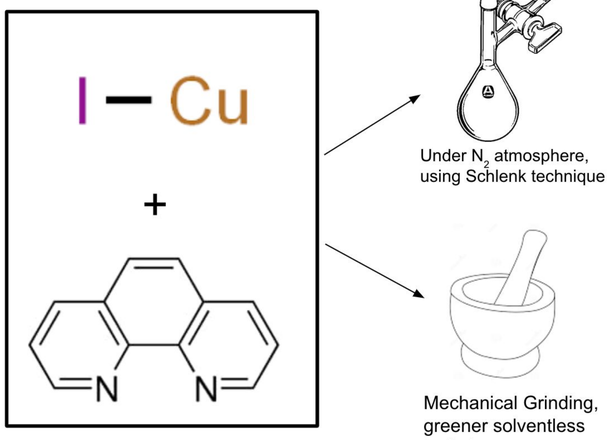
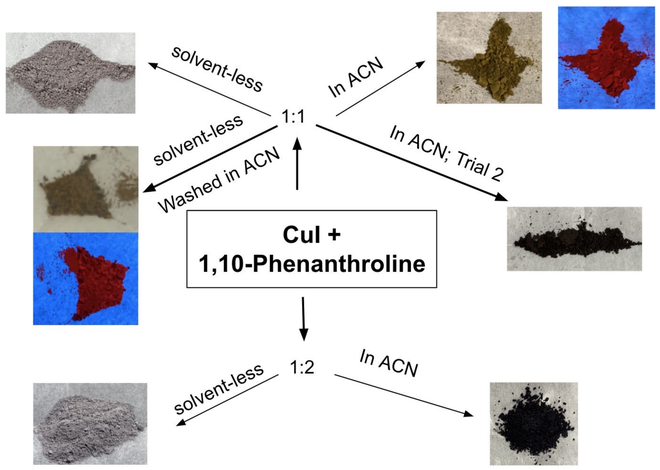
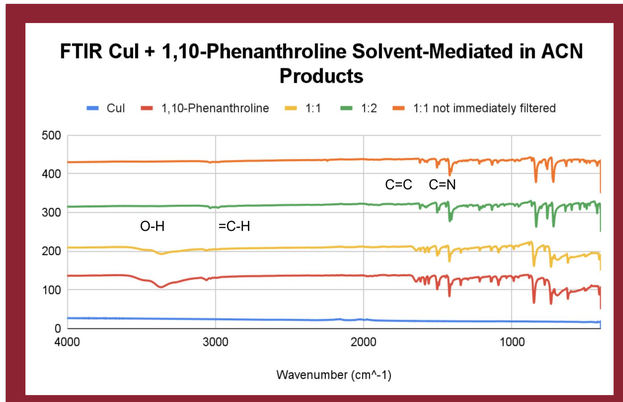
## INTRODUCTION

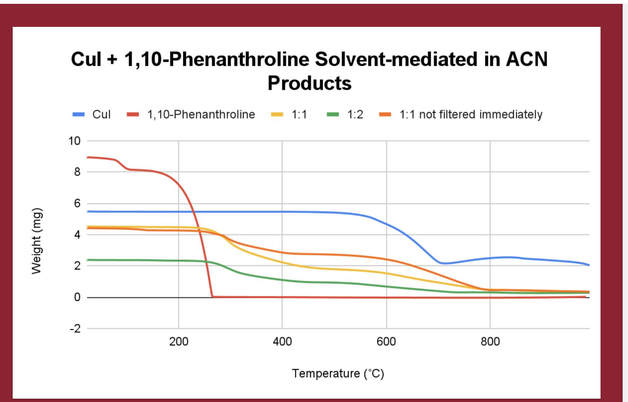
- **Copper based metal complexes have structural and luminescence properties that allow it to interact with DNA, and are widely used in chemotherapeutic drugs and diagnostic agents.**
- **1,10-phenanthroline is a diamine ligand with a chelating binding mode to the copper and has been extensively used due to its versatile combination of structural and chemical properties.**

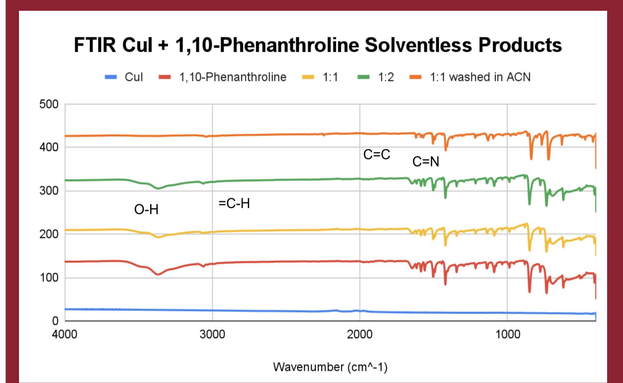
## METHODS

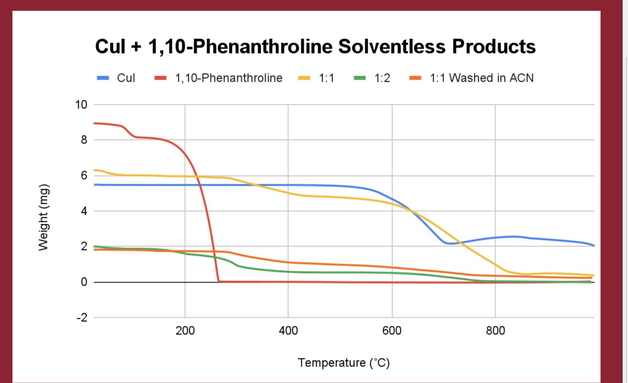


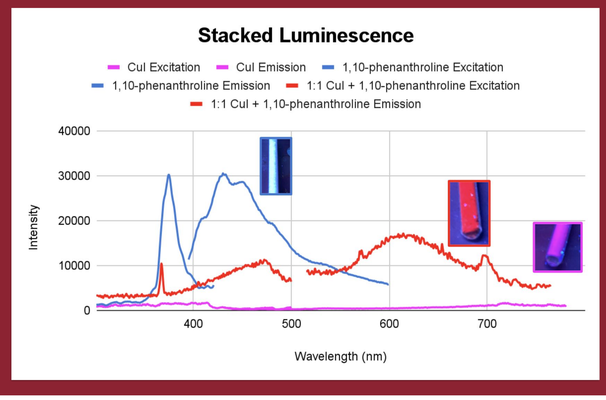




| Elemental Analysis | Experimental | | | Theoretical Results | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | C | H | N | C | | H | | N | | Cu | | I | | O |
| Sample | | | | | w/ $H_2O$ | | w/ $H_2O$ | | w/ $H_2O$ | | w/ $H_2O$ | | w/ $H_2O$ | w/ $H_2O$ |
| 1,10-phenanthroline | 73.26 | 4.99 | 14.11 | 79.98 | 71.71 | 4.47 | 5.08 | 15.54 | 14.13 | - | - | - | - | 8.07 |
| 1:1 CuI + 1,10-phenanthroline | 46.84 | 1.55 | 9.43 | 38.89 | 37.08 | 2.18 | 2.59 | 7.56 | 7.21 | 17.14 | 16.35 | 34.24 | 32.65 | 4.12 |
| 1:1 SOLVENTLESS | 36.69 | 1.57 | 7.05 | | | | | | | | | | | |
| 1:1.5 CuI + 1,10-phenanthroline | | | | 46.92 | - | 2.62 | - | 9.12 | - | 13.79 | - | 27.54 | - | - |
| 1:2 CuI + 1,10-phenanthroline | 51.92 | 2.45 | 9.98 | 52.33 | 50.67 | 2.93 | 3.19 | 10.17 | 9.85 | 11.54 | 11.17 | 23.04 | 22.32 | 2.81 |
| 1:2 SOLVENTLESS | 54.34 | 3.25 | 10.45 | | | | | | | | | | | |
| 1:2.5 CuI + 1,10-phenanthroline | | | | 56.22 | - | 3.14 | - | 10.93 | - | 9.91 | - | 19.80 | - | - |

## DATA TABLES

| TGA Table | Weight Change 1 | Weight Change 2 | Weight Change 3 | Total Weight Change | Temp 1 | Temp 2 | Temp 3 |
|---|---|---|---|---|---|---|---|
| CuI | 1.756% | 74.06% | | 86.08% | 194˚C | 642˚C | |
| 1,10-Phenanthroline | 9.266 % | 90.46% | | 99.71% | 94.51˚C | 266˚C | |
| 1:1 CuI + 1,10-Phen in ACN | 1.033% | 60.09% | 32.54% | 93.71% | 140˚C | 300˚C | 647˚C |
| 1:2 CuI + 1,10-Phen in ACN | 2.116% | 58.27% | 27.49% | 87.90% | 157˚C | 287˚C | 591˚C |
| 1:1 CuI + 1,10-Phen in ACN not filtered immediately | 3.201% | 34.72% | 58.87% | 92% | 133˚C | 291˚C | 717˚C |

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| 1:1 CuI + 1,10-Phen Solventless | 5.203% | 20.26% | 68.84% | 92.24% | 47˚C | 298˚C | 723˚C |
| 1:2 CuI + 1,10-Phen in ACN | 6.958% | 66.40% | 27.62% | 100.9% | 82˚C | 299˚C | 736˚C |
| 1:1 CuI + 1,10-Phen in ACN not filtered immediately | 4.506% | 41.10% | 41.42% | 87.03% | 143˚C | 298˚C | 733˚C |

## POTENTIAL APPLICATIONS

- Potential applications consist of solar energy materials, energy-efficient light-emitting diodes (LED), smart phones, organic LED (OLED) TVs, medical drugs, and diagnostic tools for cancer and other diseases.

## DISCUSSION & CONCLUSION

- Successful synthesis of various new novel products of CuI + 1,10-phenanthroline.
- The solventless and solvent-mediated products had slight differences in characterizations.
- The 1:1 CuI + 1,10-phenanthroline products were red shifted with emission peak maximum at 650 nm when compared to the 1,10-phenanthroline ligand alone with an emission peak maximum of 430 nm.

## ACKNOWLEDGEMENT

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