

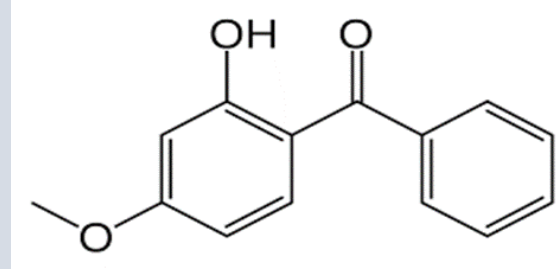


Development of colorimetric technique for quantitative analysis of oxybenzone by formation of copper complex

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Mahidol Wittayanusorn School

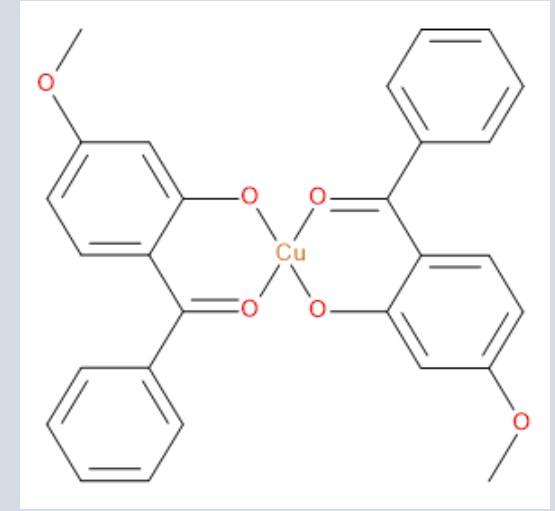


Abstract – Development of colorimetric technique for quantitative analysis of oxybenzone by formation of copper complex



oxybenzone

Cu^{2+}



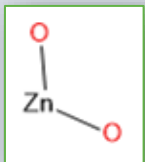
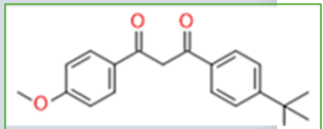
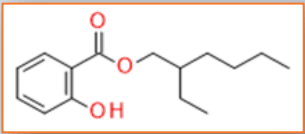
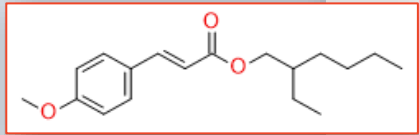
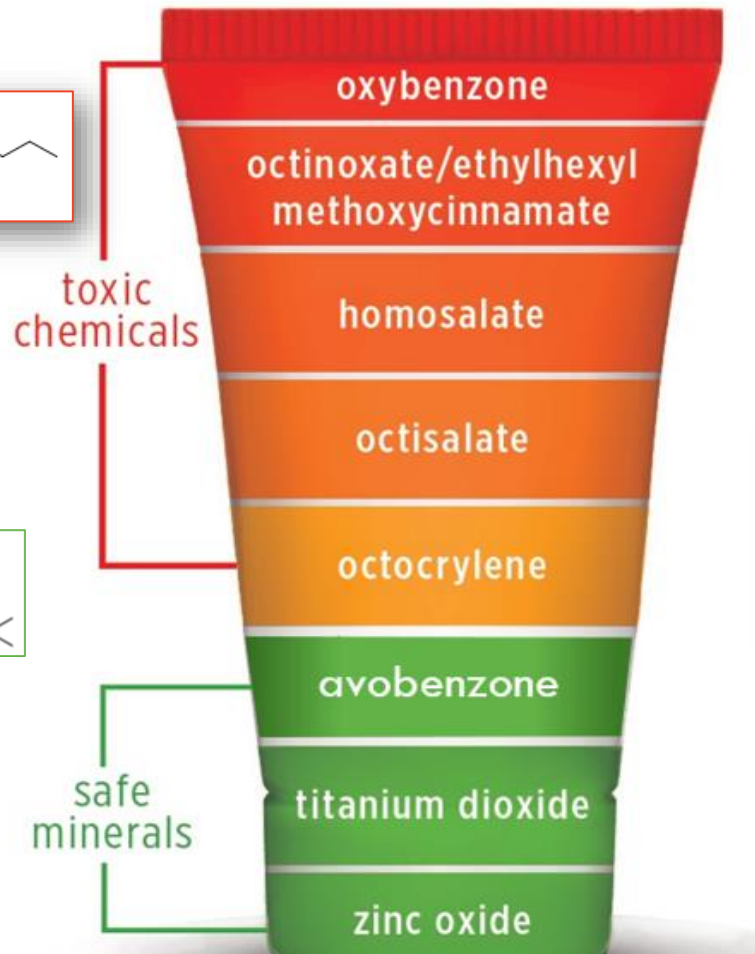
complex



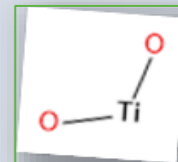
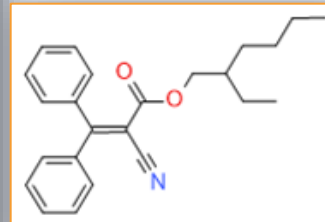
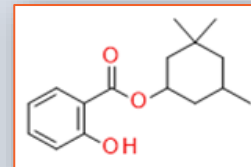
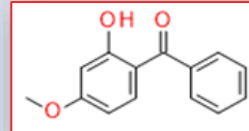
INTRODUCTION

SUNSCREEN TOXICITY RATINGS*


*from EWG.org/SkinDeep



Oxybenzone



Toxic Chemicals in Sunscreen



Oxybenzone
hormone disruption,
organ system toxicity,
toxic to coral reefs

Octinoxate
hormone disruption,
reproductive toxicity,
toxic to coral reefs

Homosalate
hormone disruption;
enhanced absorption of
pesticides

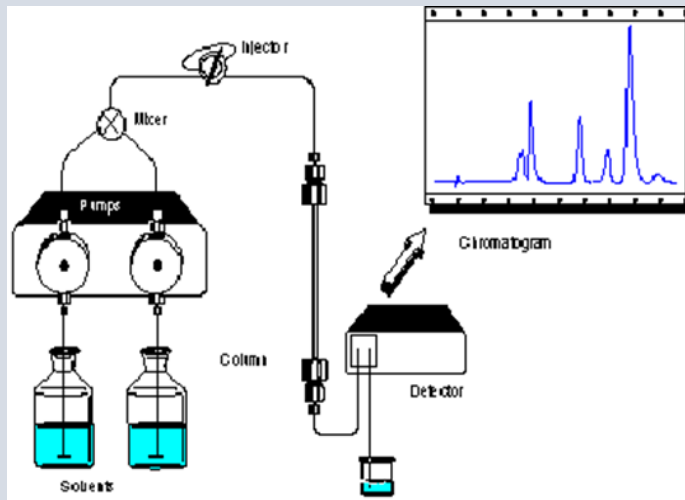
Nanoparticles
have not been properly
assessed for human or
environmental health effects

MADE WITH SAFE INGREDIENTS™

Njies Pedjie. (2013).

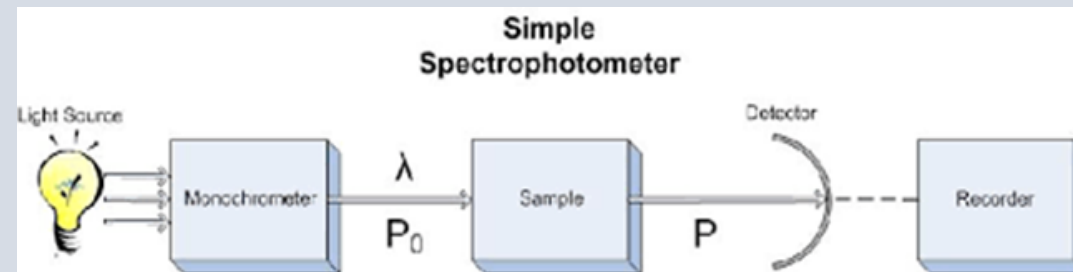
INTRODUCTION

Analysis of Oxybenzone



HPLC

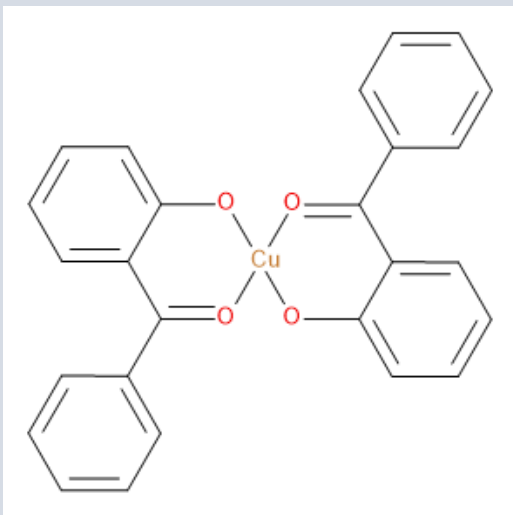
- High cost
- Only available in specialize laboratory



UV-Vis spectroscopy

- Low cost
- Available in most laboratory
- Oxybenzone can absorb light in ultraviolet region that cannot be measure by portable instrument

INVESTIGATIVE APPROACH / THEORETICAL BACKGROUND

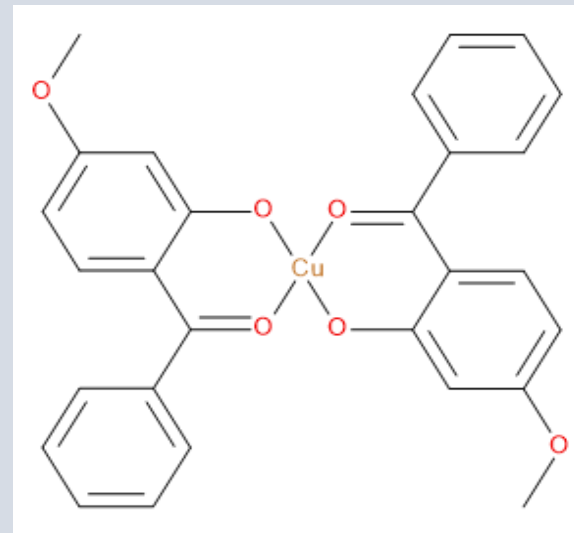


benzophenone-copper complex

- To develop a quantitative analysis method of oxybenzone in an environment by using UV-vis spectroscopy technique based on the formation of oxybenzone-copper complex

- A catalyst for oxidation of olefin
- Report to have absorption in visible region at 400 nm (yellow color solution)

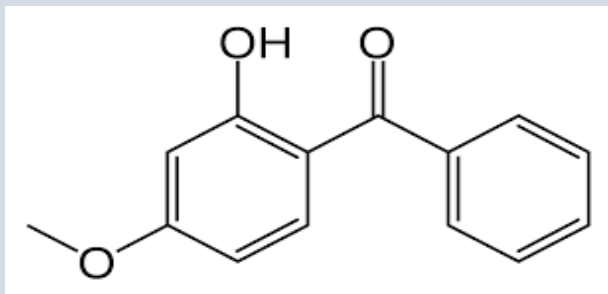
M. Lashanizadegan et al. (2017).



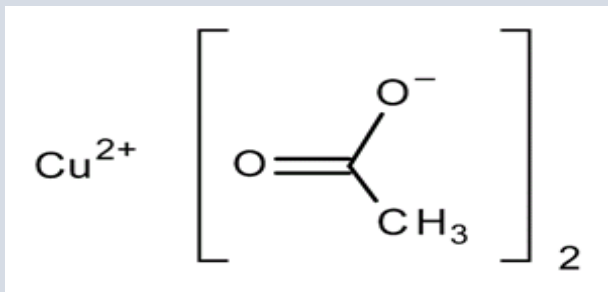
Oxybenzone-copper complex

RESOURCES

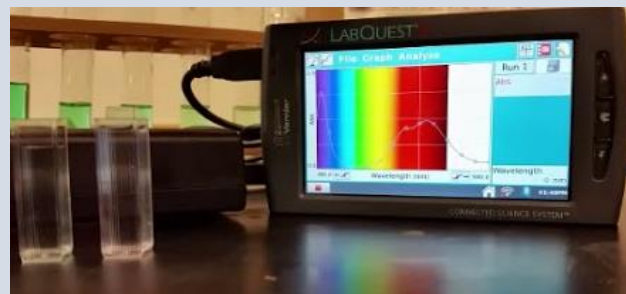
Quantitative analysis of Oxybenzone



Oxybenzone in 5 mM in ethanol

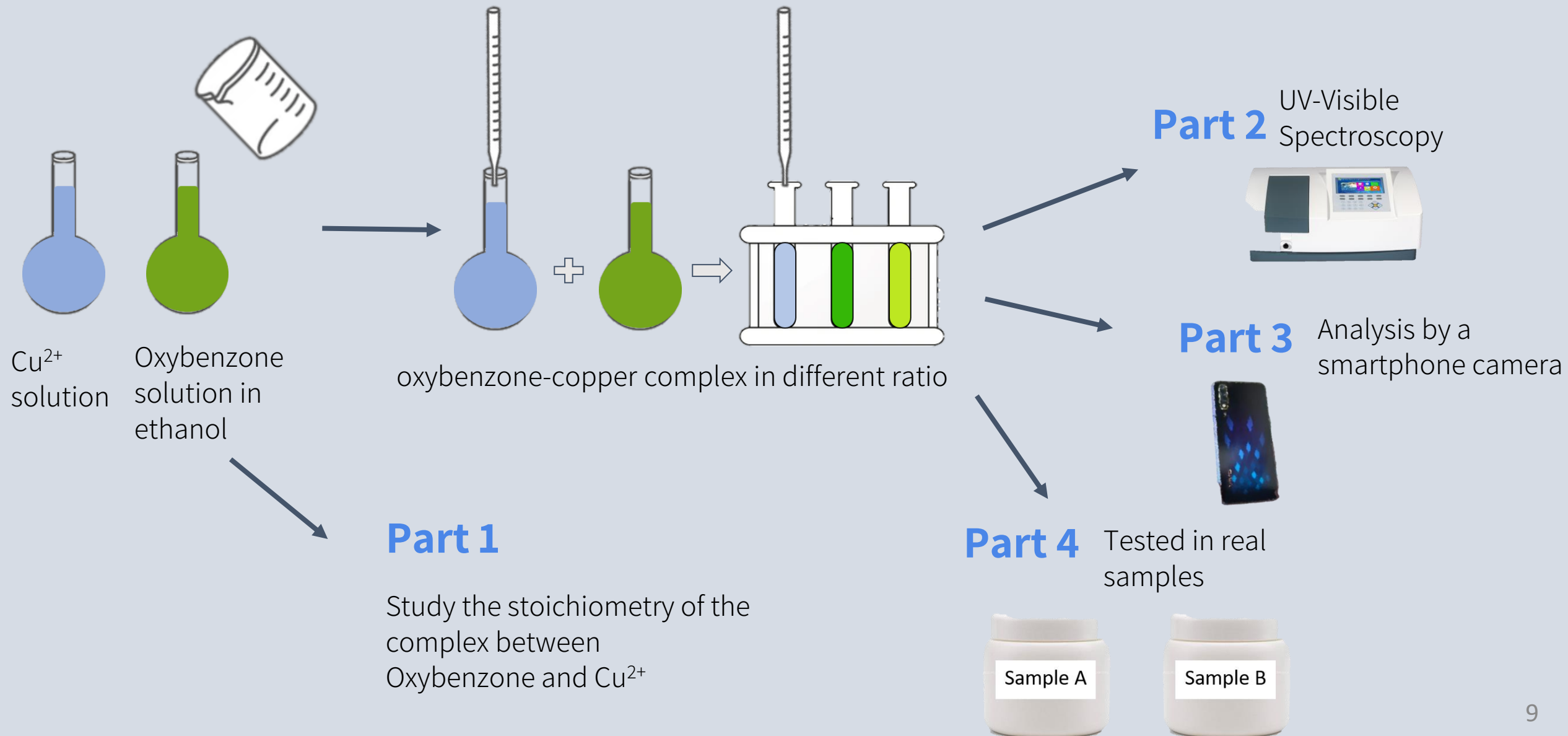


Copper(II) acetate 5 mM in ethanol



UV-Vis spectrophotometer
Measure absorbance at 400 nm

METHODOLOGY / PROCEDURE



METHODOLOGY / PROCEDURE

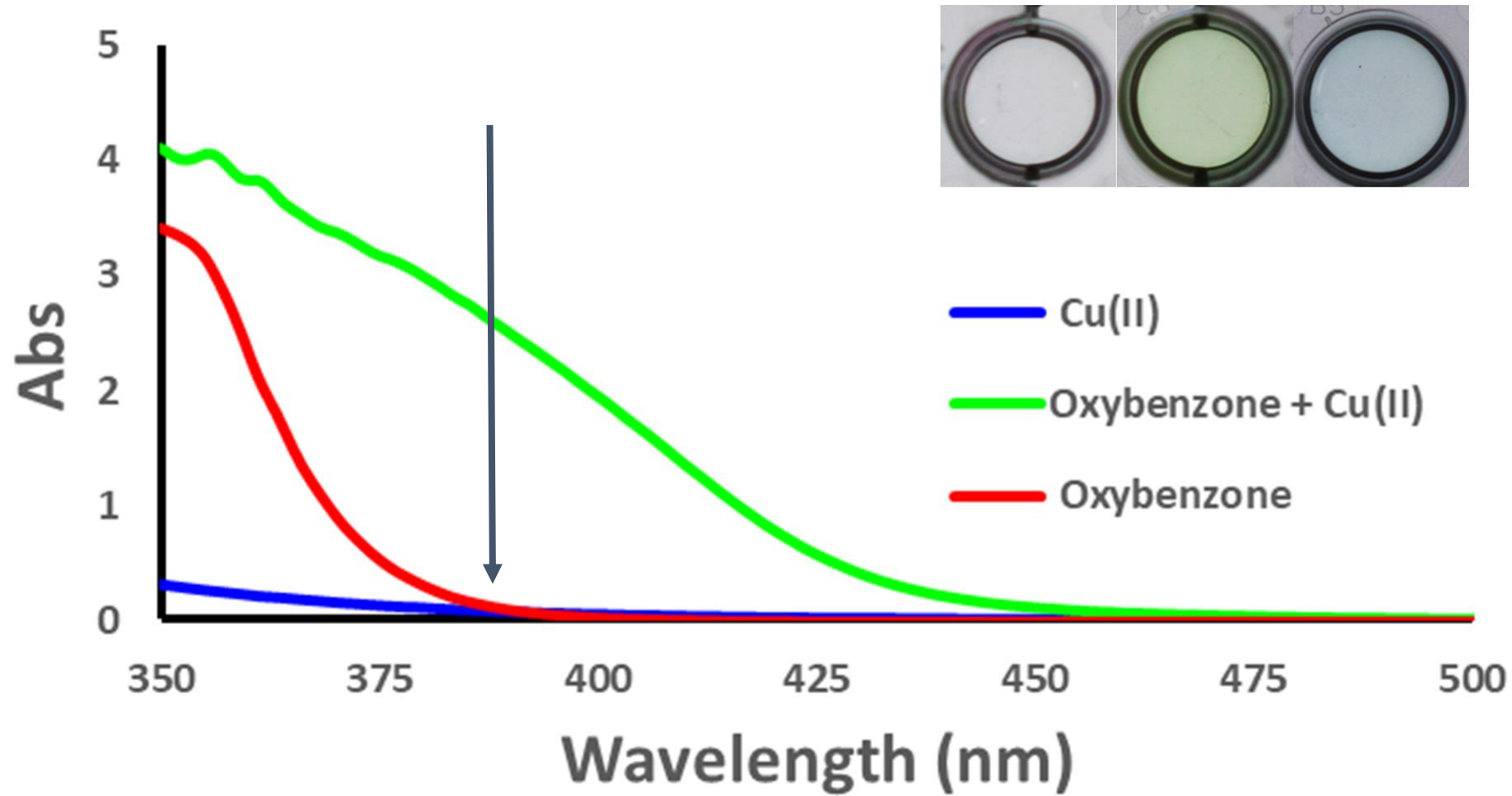


Figure 1 Full spectrum absorbance of oxybenzone, copper(II) acetate, and oxybenzone-copper complex in ethanol

FINDINGS AND ANALYSIS OF FINDINGS

The stoichiometry of the complex between Oxybenzone and Cu^{2+}

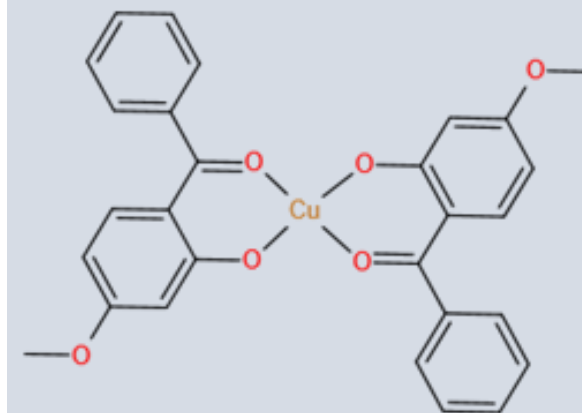
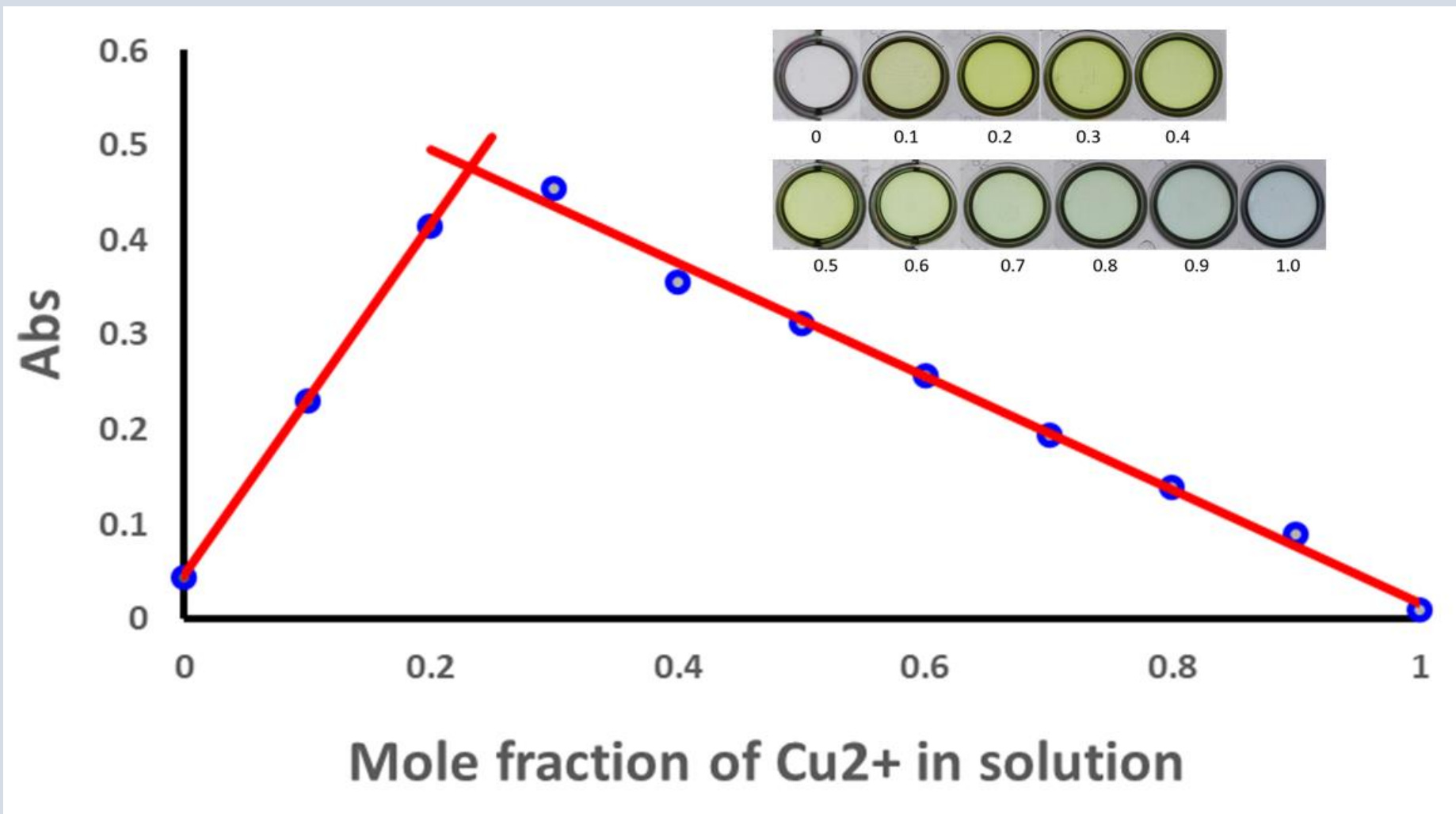


Figure 2 Job plot of Oxybenzone-copper complex

FINDINGS AND ANALYSIS OF FINDINGS

Linear region for Oxybenzone analysis

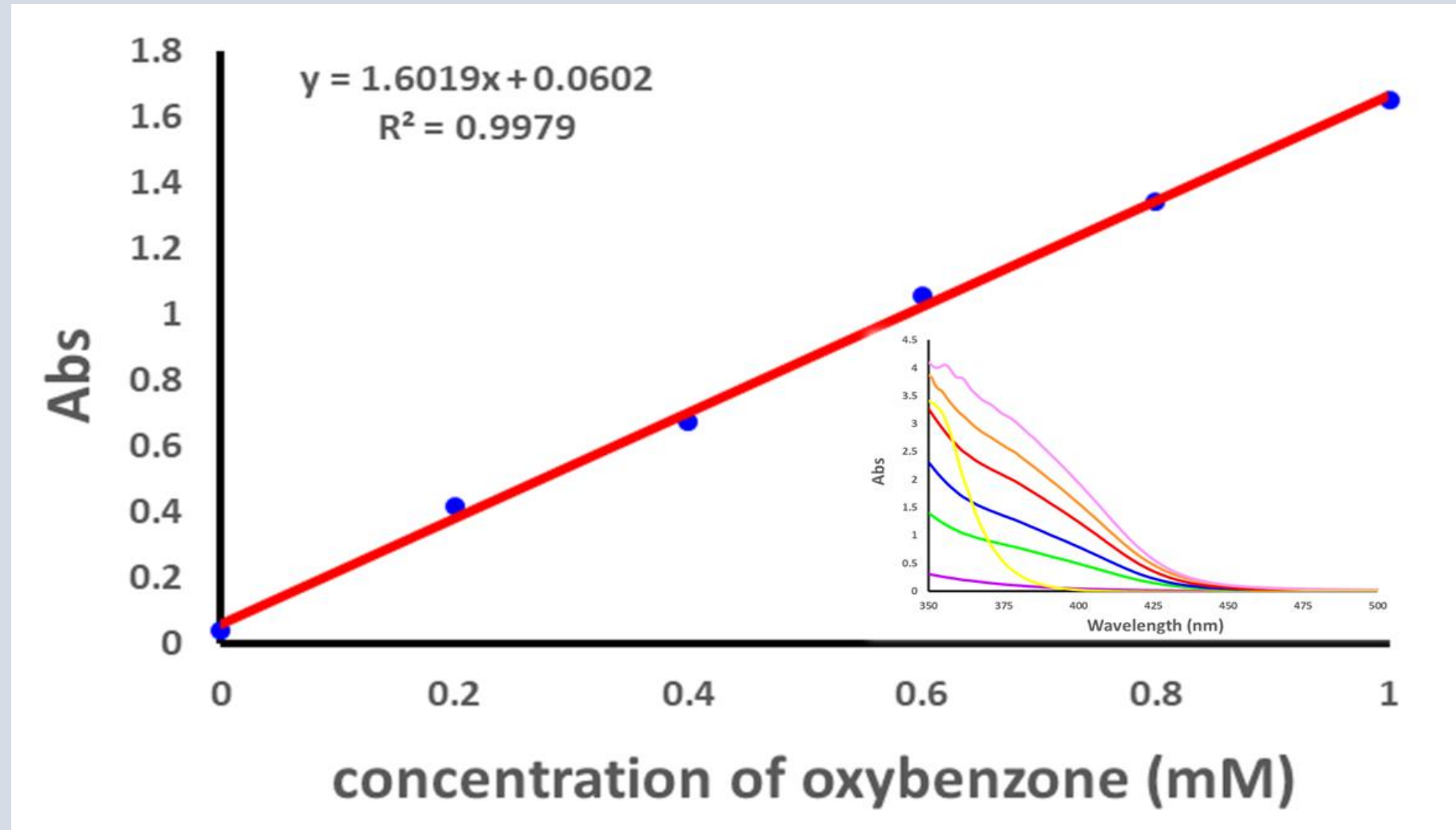


Figure 3 Standard curve of oxybenzone in the presence of excess of Cu(II)

FINDING AND ANALYSIS OF FINDINGS

Analysis by smartphone camera

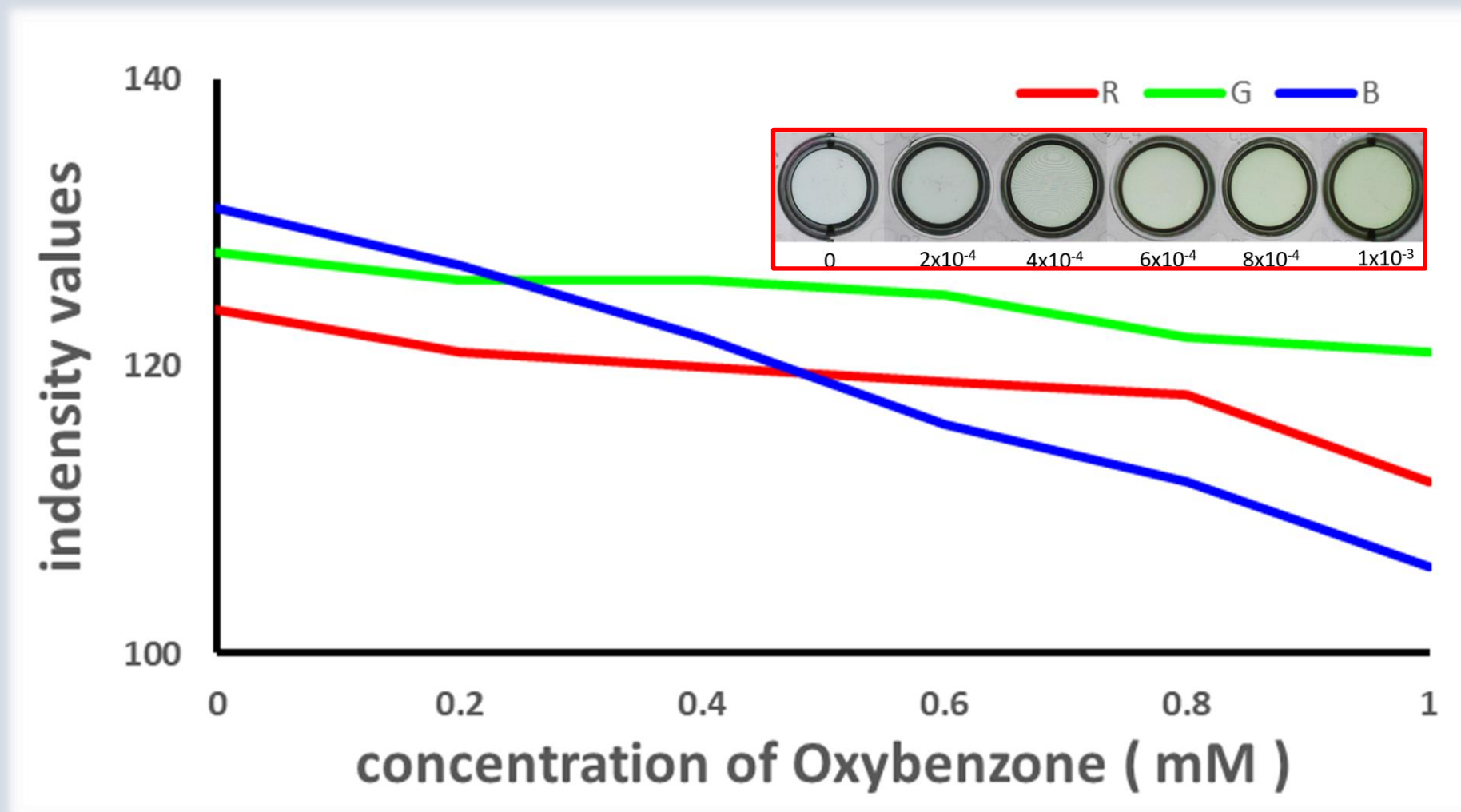
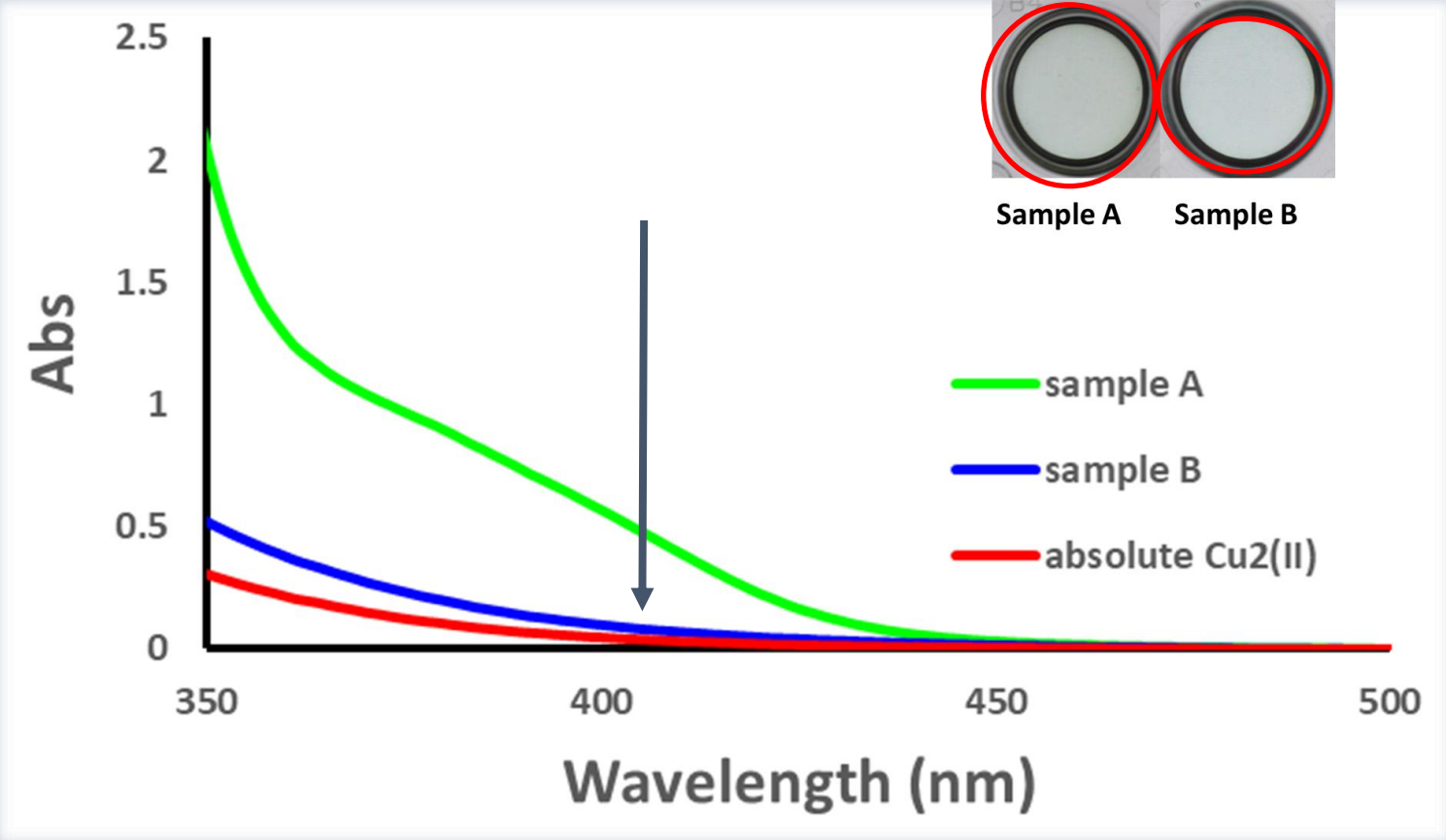


Figure 4 RGB value of oxybenzone 0.0 – 1.0 mM in the presence of excess of Cu(II)

RELEVANCE TO PRACTICAL APPLICATION

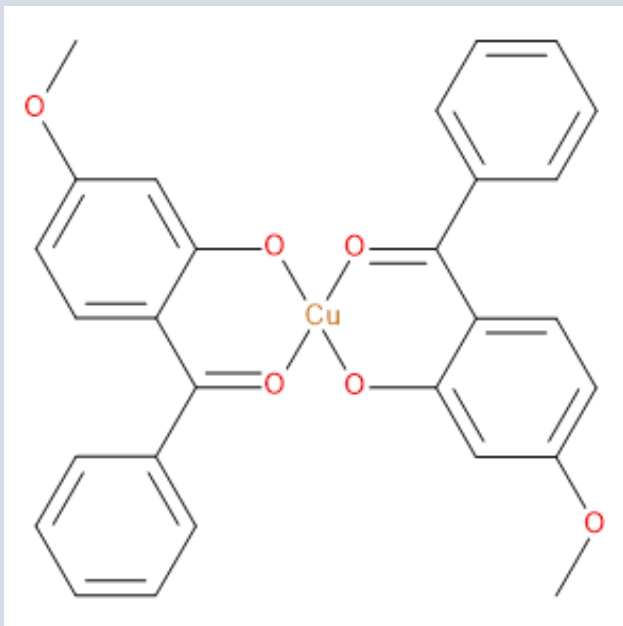
Tested in real samples



samples	UV absorber
A	Oxybenzone
B	TiO ₂

Figure 5 Test for oxybenzone in ethanolic solution of sunscreen samples

CONCLUSION



- **Linear correlation between yellow color and oxybenzone concentration**
- **Portable UV-Vis: LOD 4 $\mu\text{g}/\text{mL}$**
- **HPLC: LOD 0.2 $\mu\text{g}/\text{mL}$**
- **Apply this method to test sunscreen products**



REFERENCES

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