# Dye chemosensor synthesis and functions: *push-π-pull* system using quinoline and pyran derivatives

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## 1. INTRODUCTION

Nowadays, the most stirring developments in dye chemistry and dye application are occurring in chemosensing areas because their toxic impacts in the areas of chemical, biological, and environmental applications. In this study, the research of synthesis and characterization for quinoline based dye molecule have become increasingly important for many color formation systems, including chemosensing property application in response to the increased supply and demand. Using UV-Vis spectrophotometer, cyclicvoltammetry and computational calculation method, we estimated the detection properties of used dye.

## 2. EXPERIMENT

### 2.1 Materials and analysis

8-hydroxyquinoline and 4-(dicyanomethylene) -2,6-dimethyl-4H-pyran were purchased from Aldrich and TCI. UV-Vis spectrophotometer, model Agilent 8453 was used for measuring the absorbance. HOMO and LUMO energy levels were measured on cyclic voltammetry VersaSTAT3 in acetonitrile. The cyclicvoltammetry used three-electrode system. Cyclicvoltammetry measurement in an acetonitrile solution present of tetrabutlyammonium hexafluorophosphate electrolyte.

The reference electrode, Ag/Ag^{+} was directly immersed in the reaction cell. The working electrode was a glassy carbon. The counter electrode was a platinum wire. The optimized geometric structure and molecular orbital were calculated with *Materials studio 4.3.*

### 2.2 Synthesis

8-hydroxyquinoline (0.035 mol, 5 g) were added in 20 ml of ethanol and refluxed. After 30 min, aqueous sodium hydroxide (10 g of sodium hydroxide dissolved in 15 ml of distilled water) was added. 6 ml of then chloroform was slowly dropwised during the reaction over 1hr. Reflux was continued for 18 h. Ethanol and excess chloroform were evaporated using a rotary evaporator. The reaction mixture was poured into 125 ml of ice water and the solution was adjusted to the acidic pH condition using hydrochloric acid. After 3h, the mixture was filtrated, dried and purified using column chromatography (hexane: dichloromethane = 1:2 v/v)

## 3. RESULT AND DISCUSSION

In the case of sensor there are various requirements, most important thing is selectivity and sensitivity. In this reason, we estimated the sensing properties of dye sensor using the UV-Vis spectrophotometer. The dye sensor shows the metal ion detection properties. Especially, this dye sensor showed the selectivity for $Cu^{2+}$, $Zn^{2+}$ metal ions. The dye sensor UV-Vis absorption peak showed the decreased at 420 nm when the metal ions concentration increased. At the same time, a new UV-Vis absorption peak of dye sensor appeared at 485nm. Due to the metal binding reaction the dye sensor showed 65nm red shift.

## 4. CONCLUSION

In this study, we used the CV and computational calculation method in order to estimate of dye sensors metal sensing properties and electrochemical properties because electrochemical properties related metal binding reaction.

According to these measurements, we get the metal binding position and electron distribution of target molecules. Finally, the dye sensor could be utilized as a simple sensing material in chemical, environmental and biological systems.

## 5. REFERENCES

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