Multiple SERS detection of phenol derivatives in tap water

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  - Phenols detection
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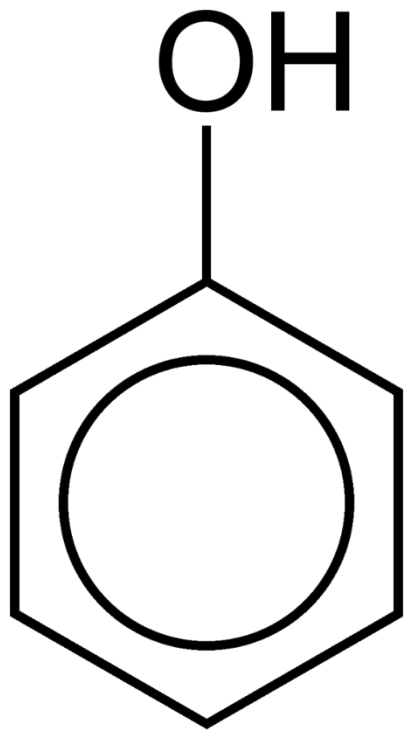
INTRODUCTION

WHY ARE PHENOL DERIVATIVES IMPORTANT FOR US?

a) Some phenol derivatives are employed as **pesticides** or are **metabolites of pollutants**.

b) They are produced by oil industry and are **widely distributed in soils and water**.

c) Many of them are really **noxious for human health**.

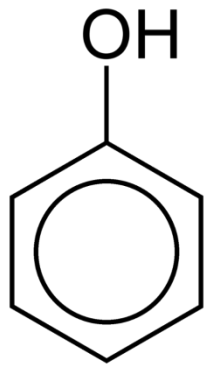


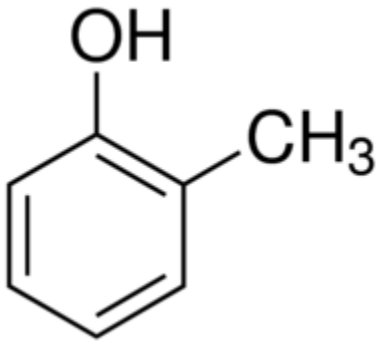
INTRODUCTION

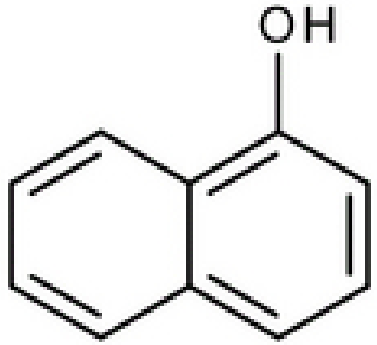
INTRODUCTION

PHENOLS DETECTION

- We prove a method to demonstrate that we are able to detect PHENOL, O-CRESOL AND 1-NAPHTHOL in tap water using Surface-enhanced Raman spectroscopy (SERS).



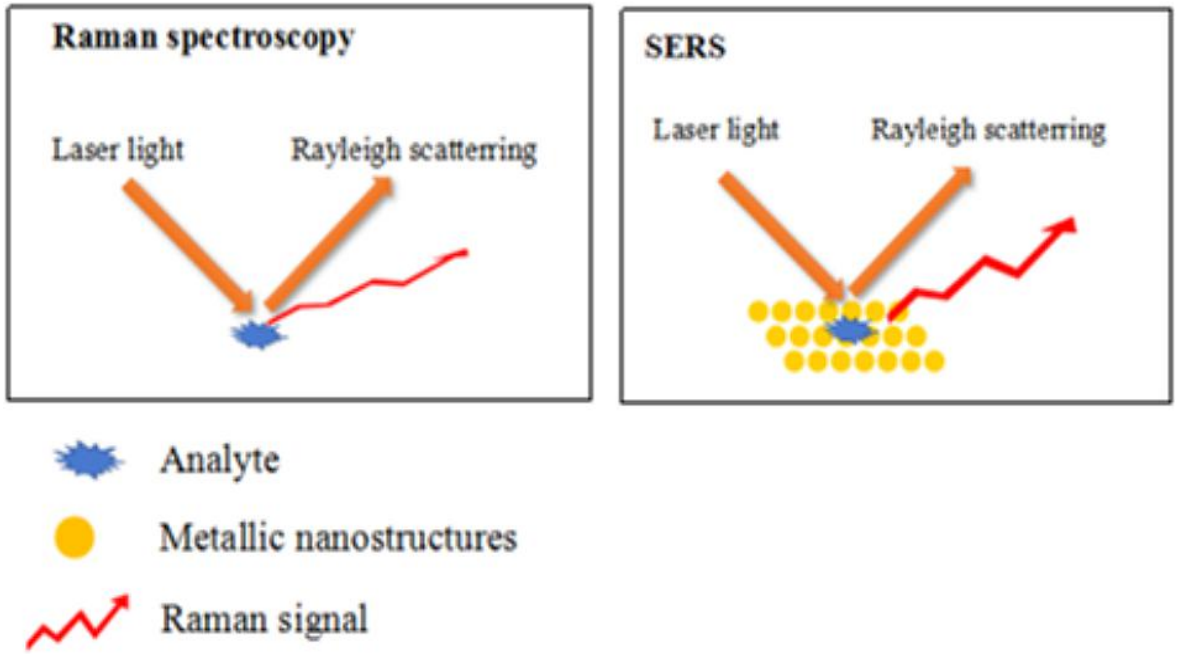




INTRODUCTION

WHY WE HAD EMPLOY SERS?

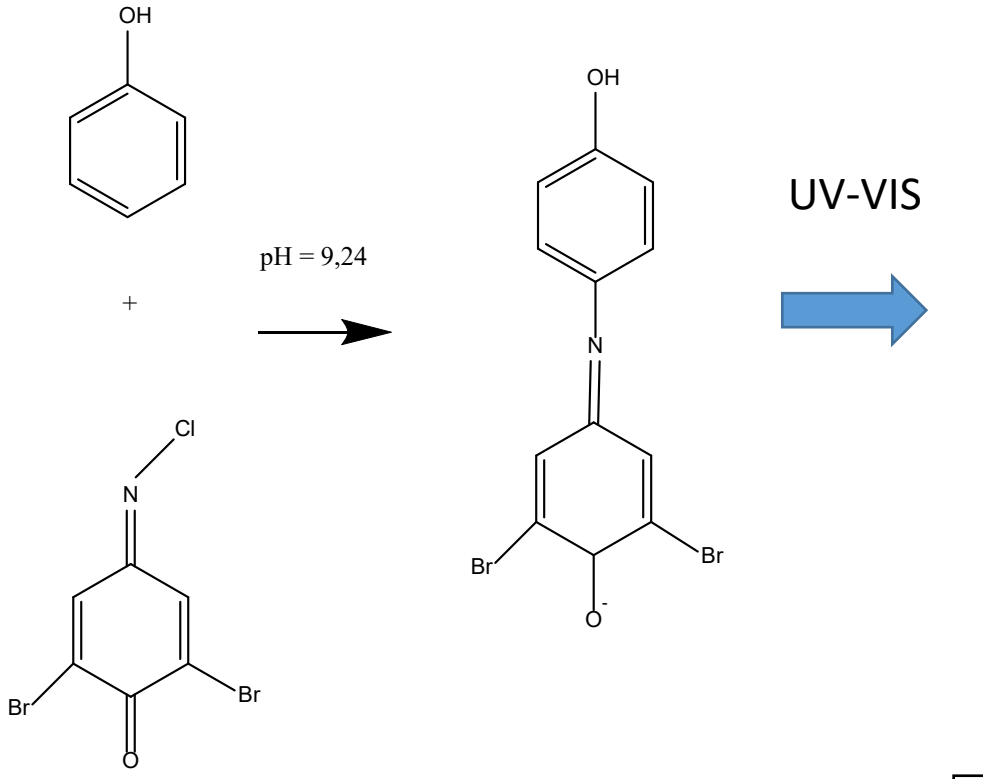
- SERS is a really powerful method that allow us to detect pollutants without a great preparation of the sample.



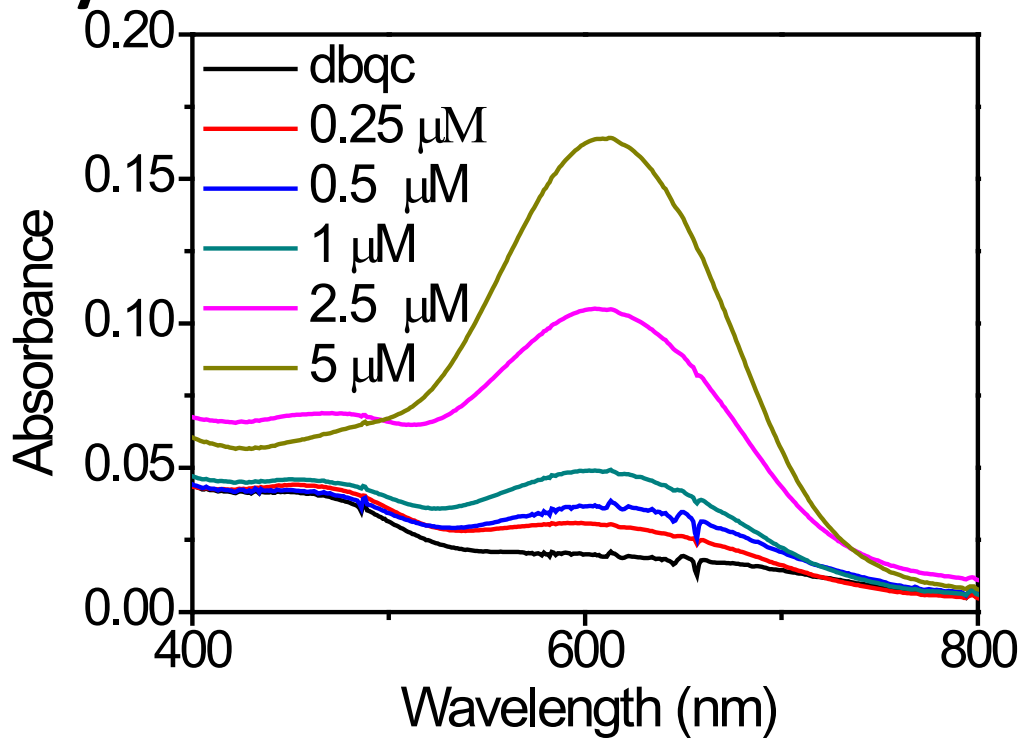
Zhao *et al.,* Front. Microbiol, 2018

INTRODUCTION

- The method is based on the colorimetric reaction between a phenol and the indophenol (Gibbs reactive) to form and indophenolate. **Our aim is to determitate phenols simultaneously**



UV-VIS

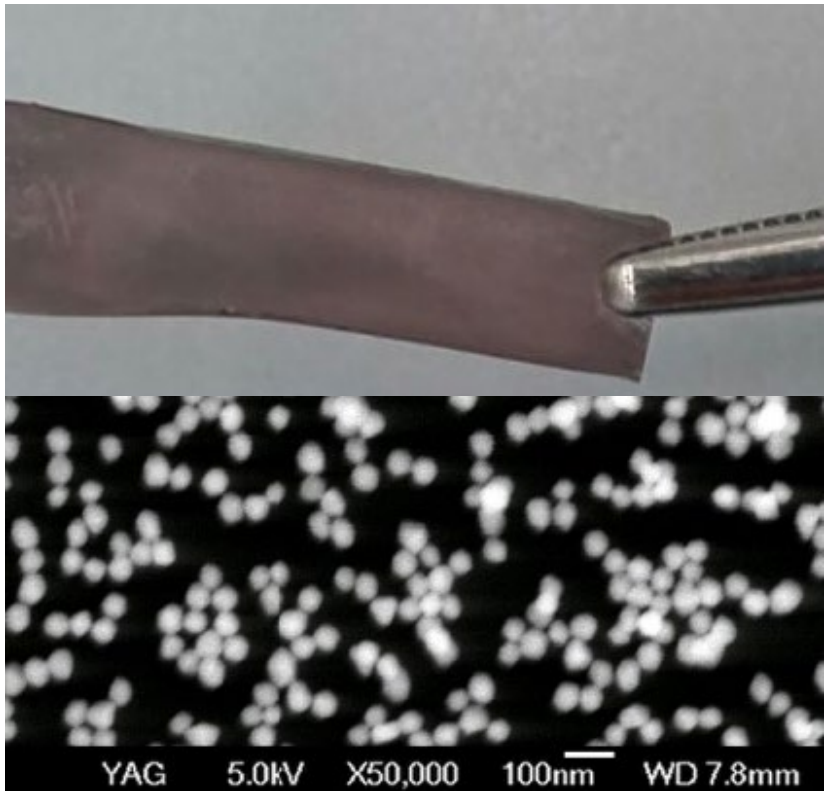


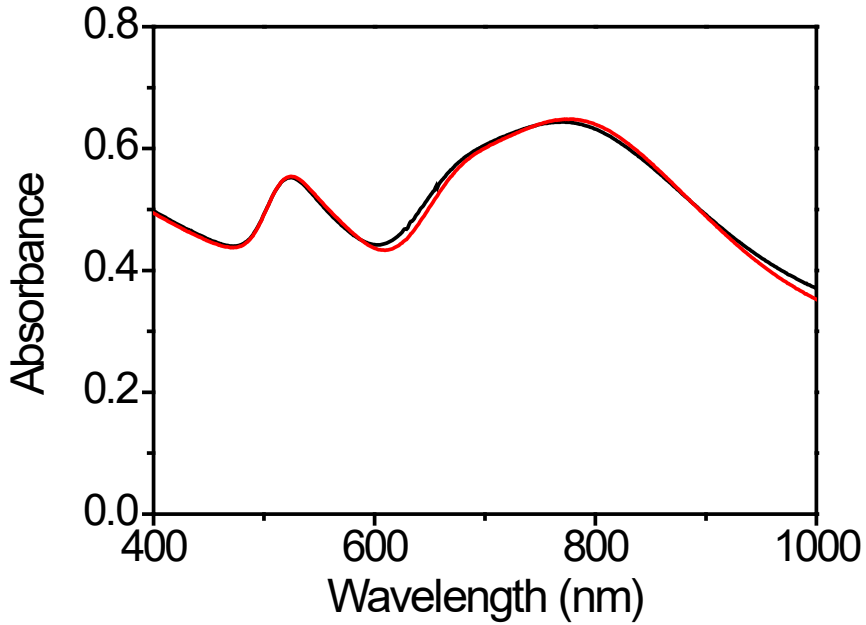
Colorless

Green-colored product

Conditions: t: 2500 s ; Gibss Reagent Concentration (DBQC) $5X10^{-5}$ M

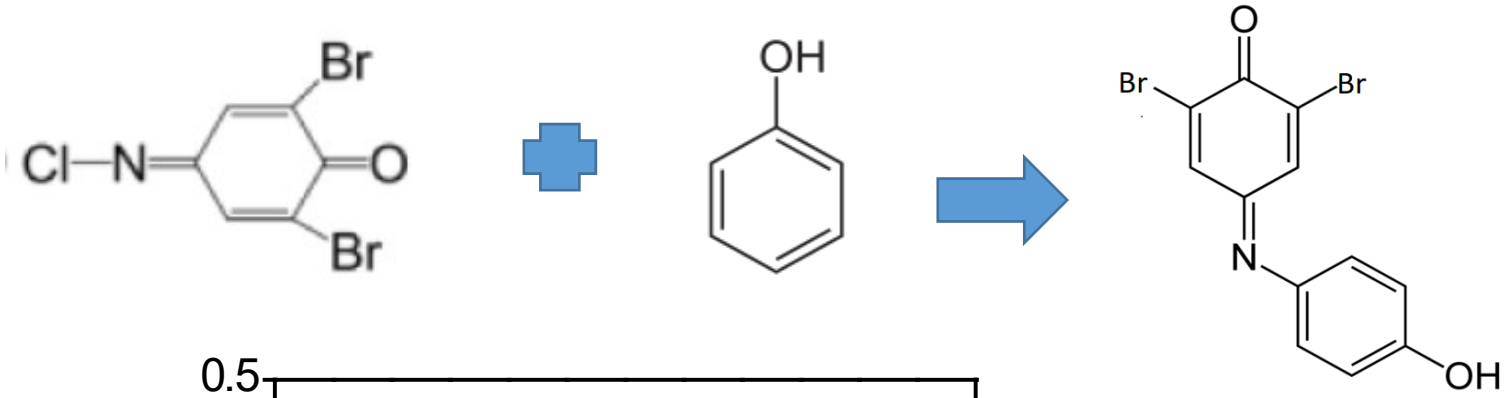
RESULTS
Plasmonic Substrates

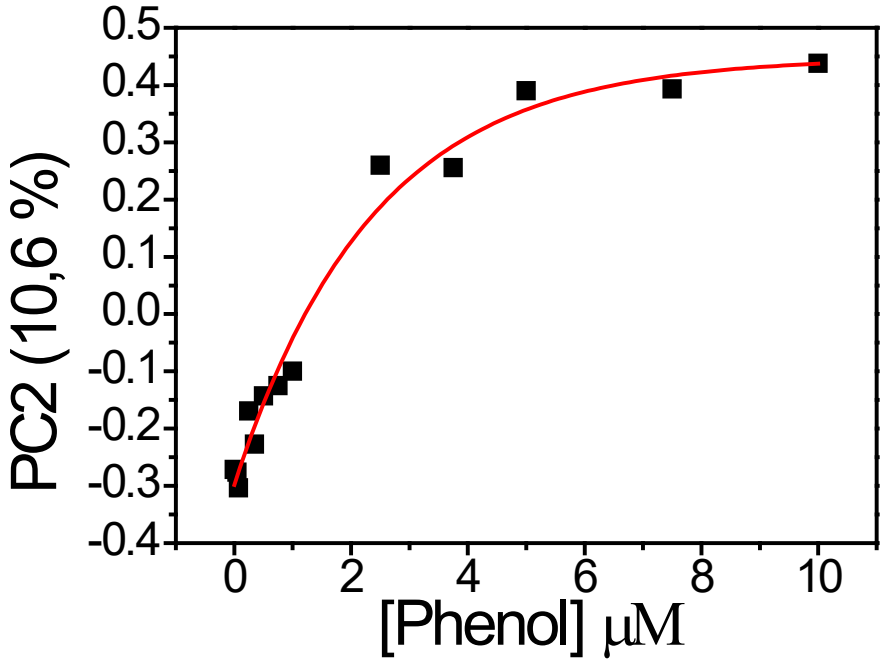




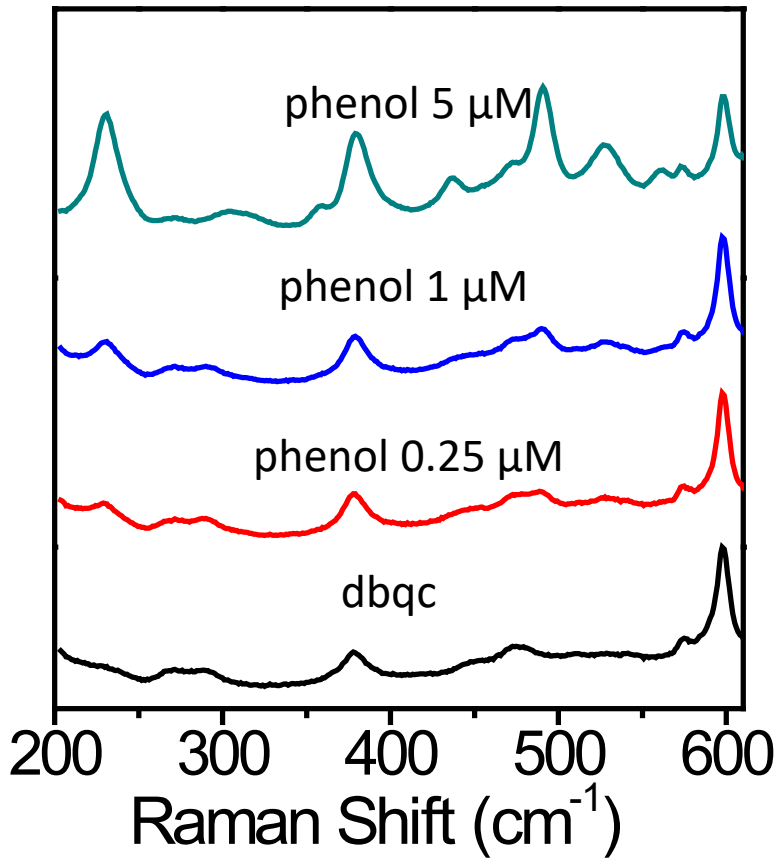
Plasmonic substrates were made with 60 nm Au@Nps

RESULTS
Phenol calibration



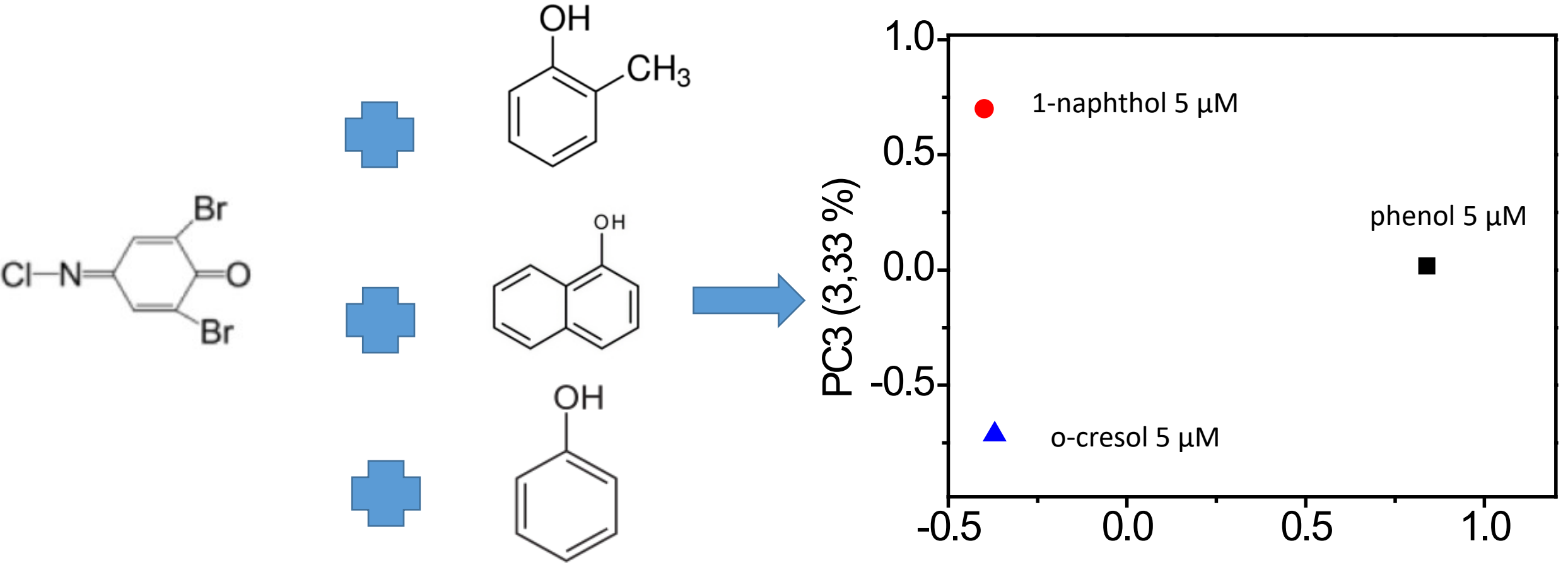


Fitted using a Hill-Langmuir equation y = A1 x (exp) (-x/t1) +y0



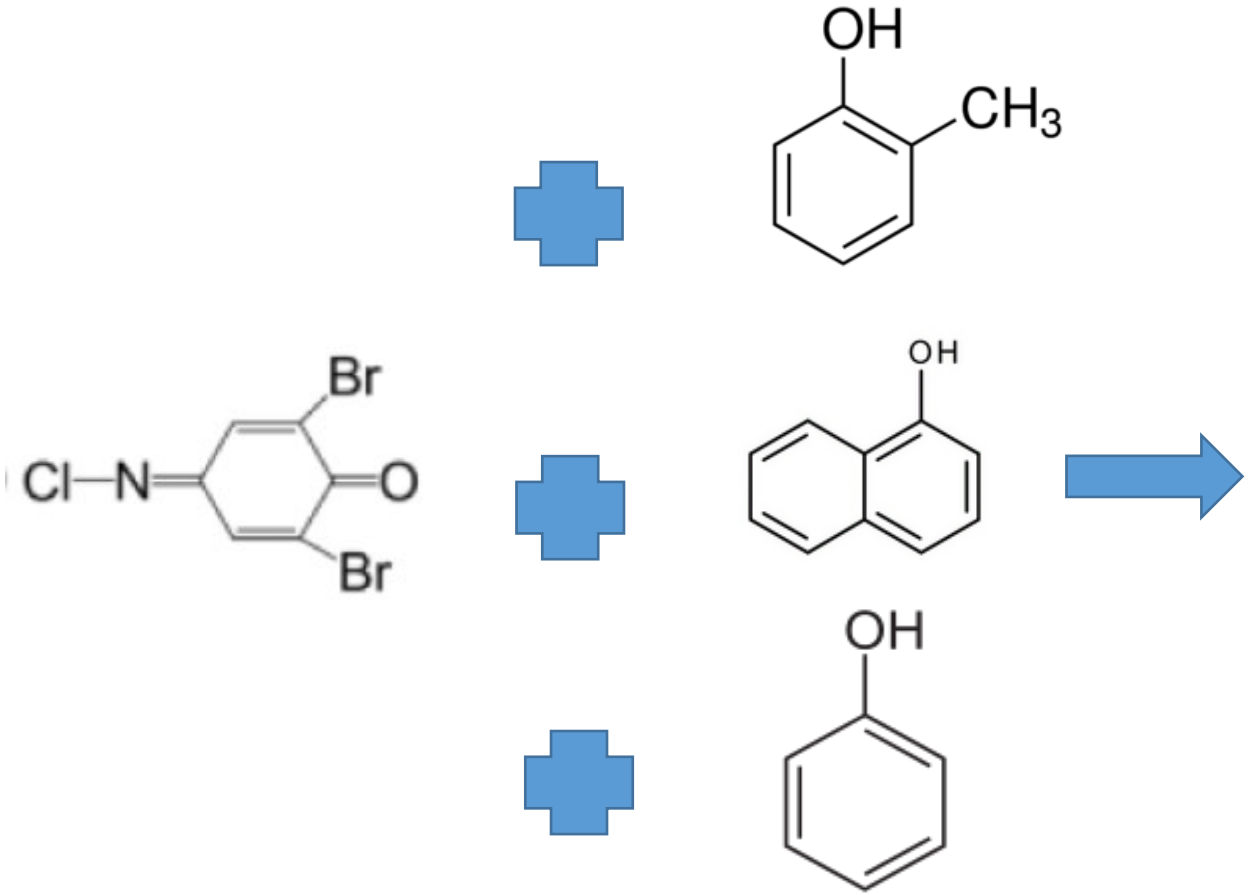
Each spectra and point is the average of 16 single spectra

RESULTS
First Step for Multiplex detection



WE COMPARE 3 SAMPLES AT THE SAME CONCENTRATION

RESULTS
First Step for Multiplex detection



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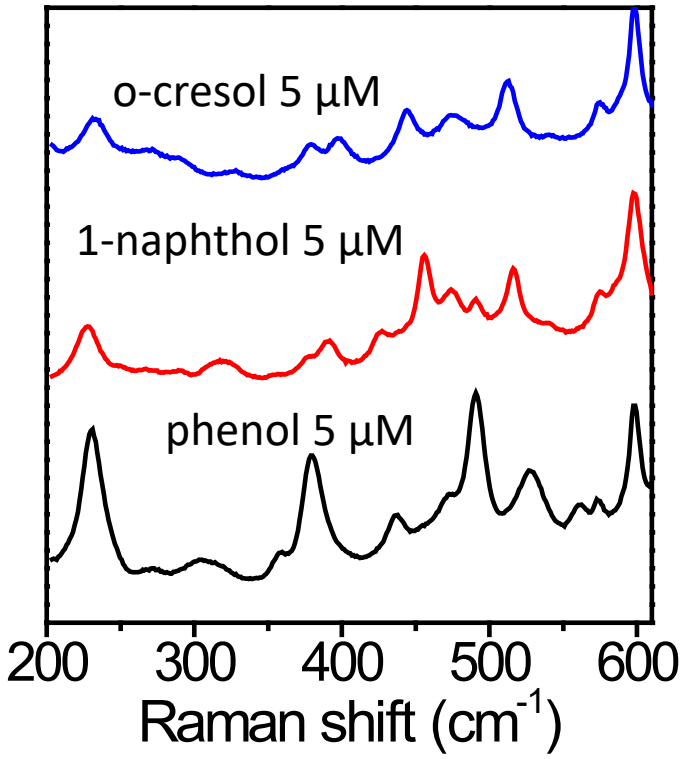
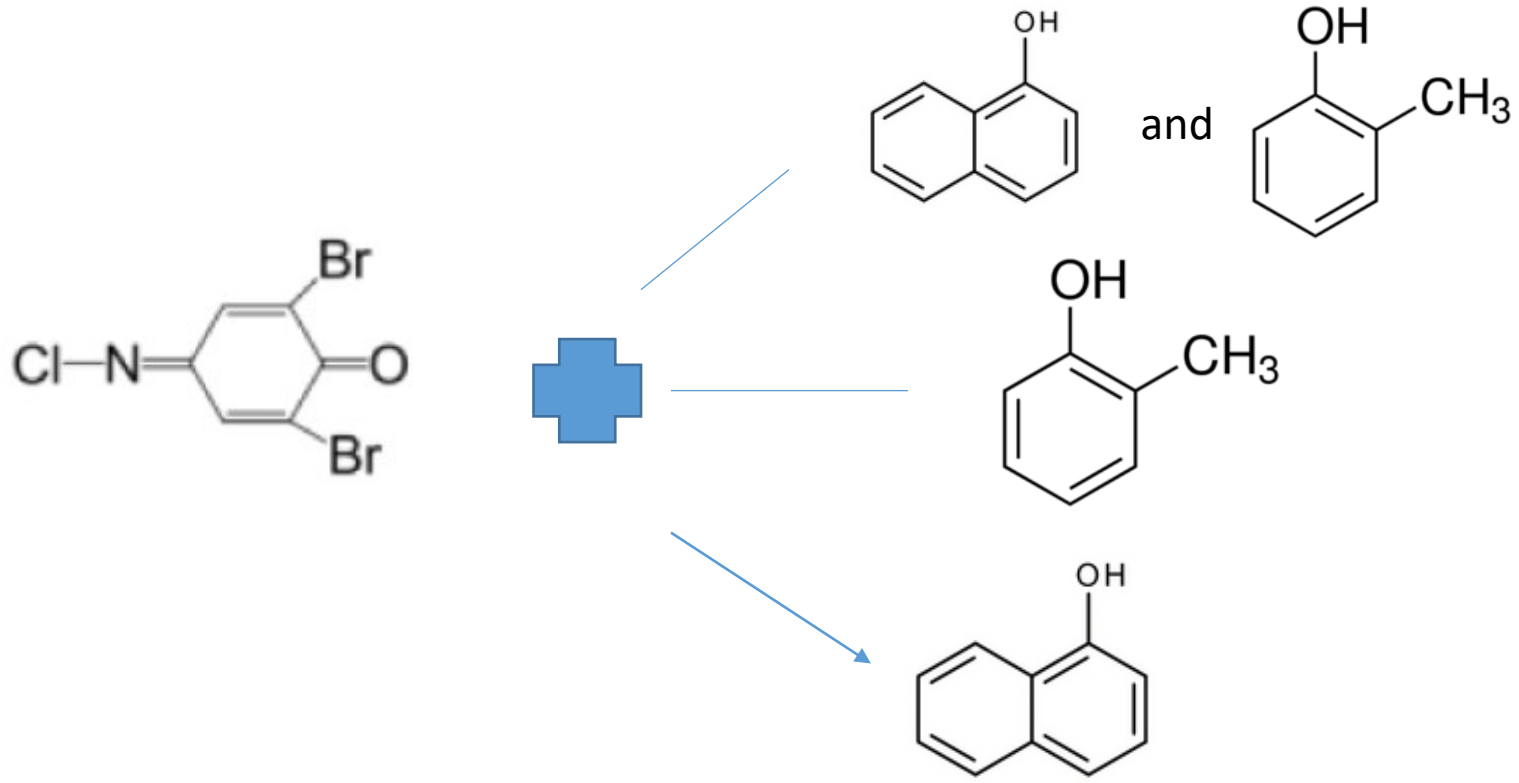
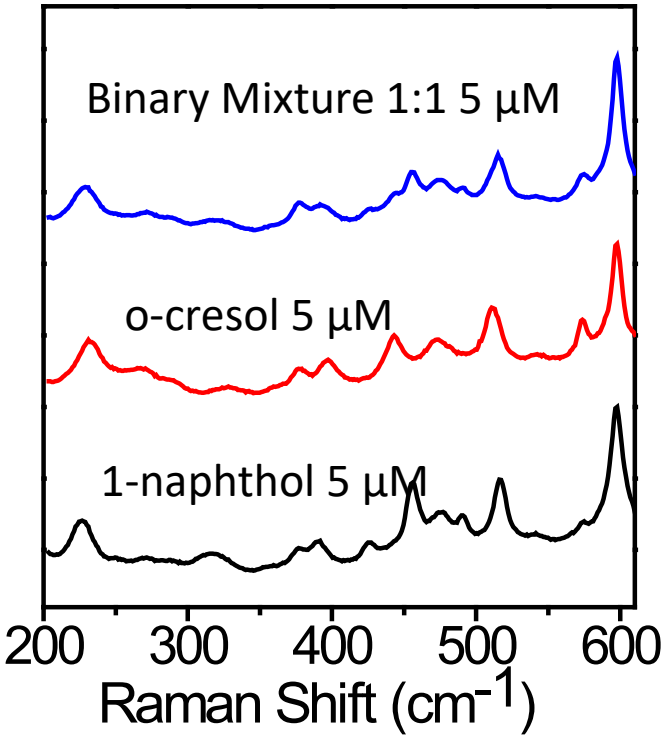


RESULTS
Semiquantitative detection

1-naphthol/o-cresol Binary Mixture





Semi-quantitative detection performed as Zou, S. et *al.*, Sci. Rep. 2017, 7.

RESULTS
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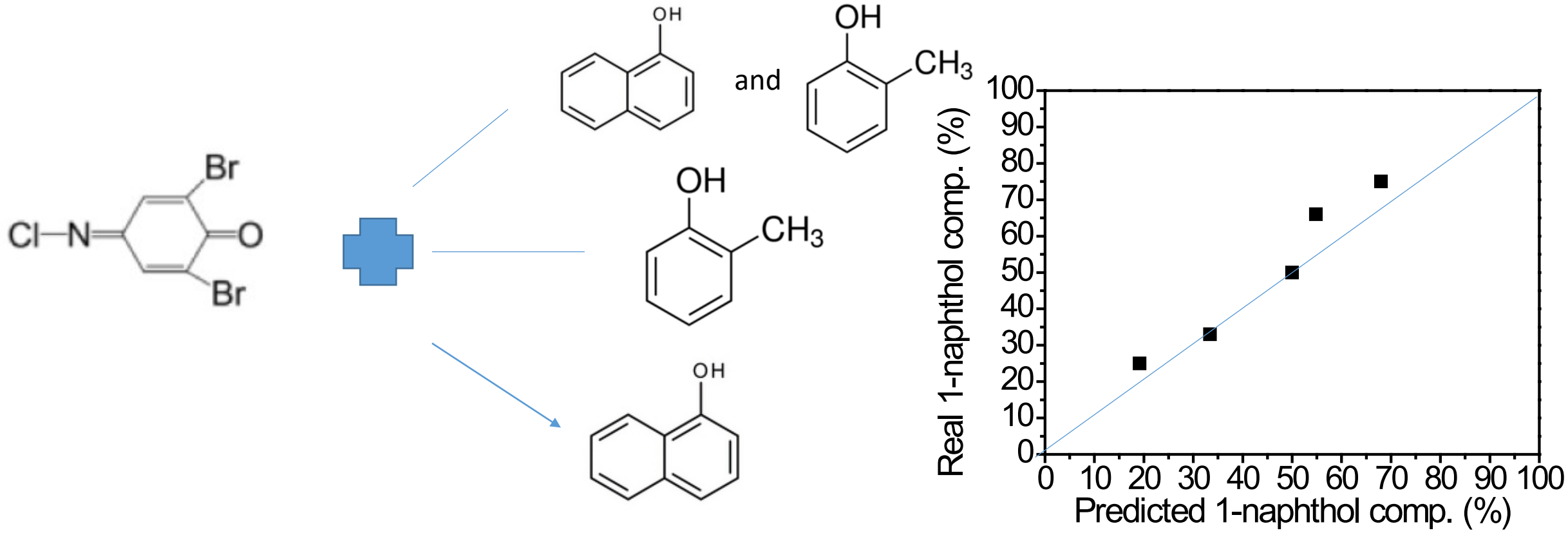

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RESULTS
Semiquantitative detection

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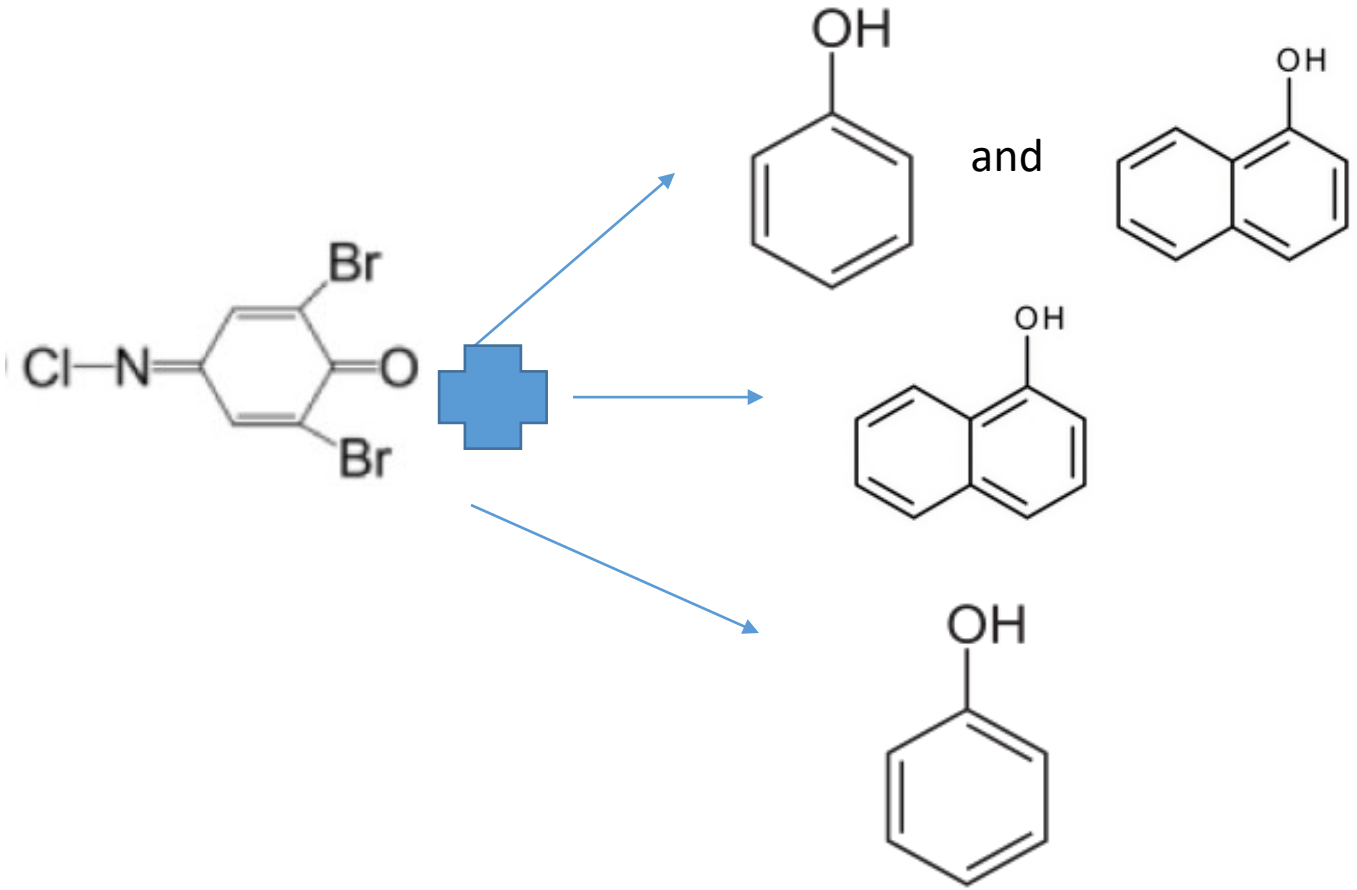

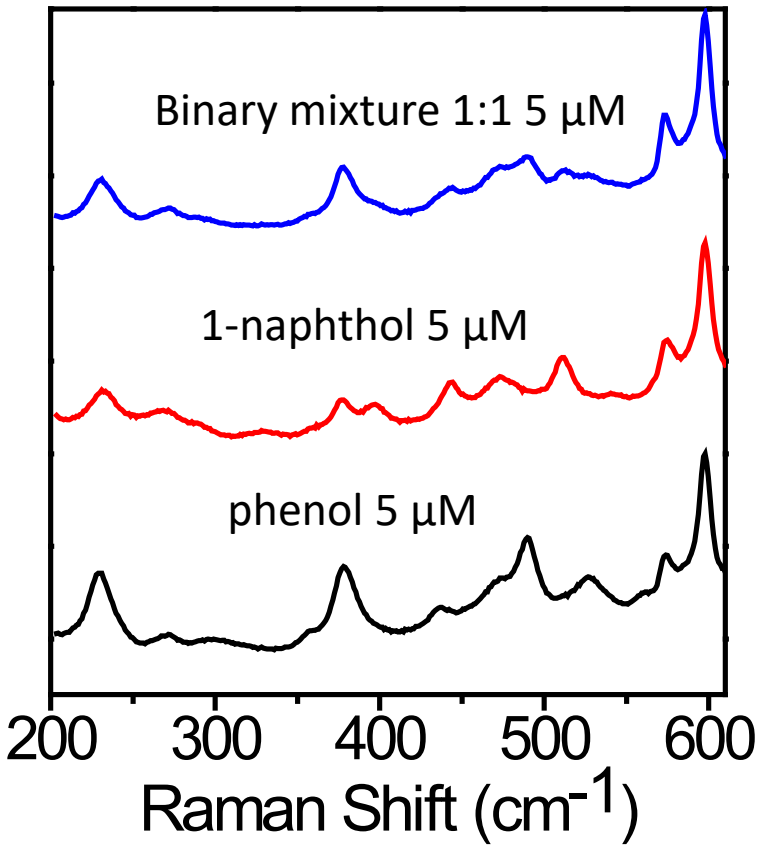

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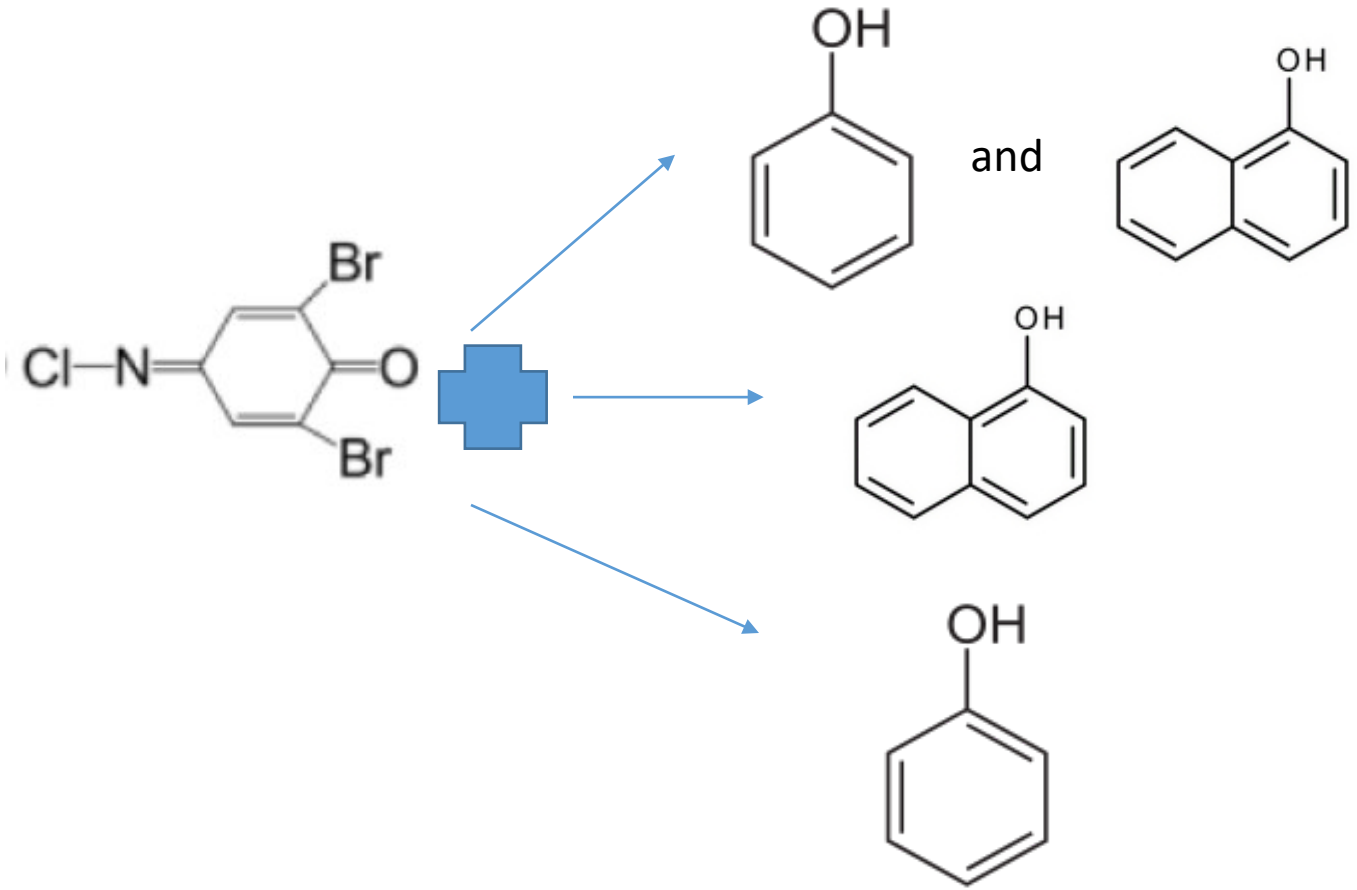

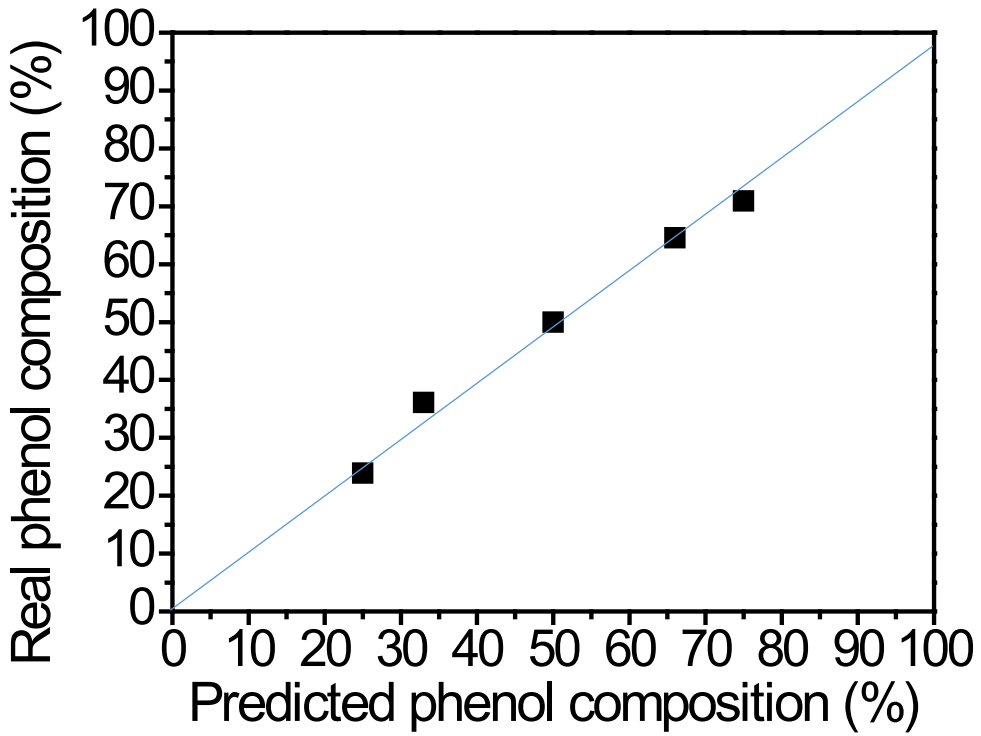

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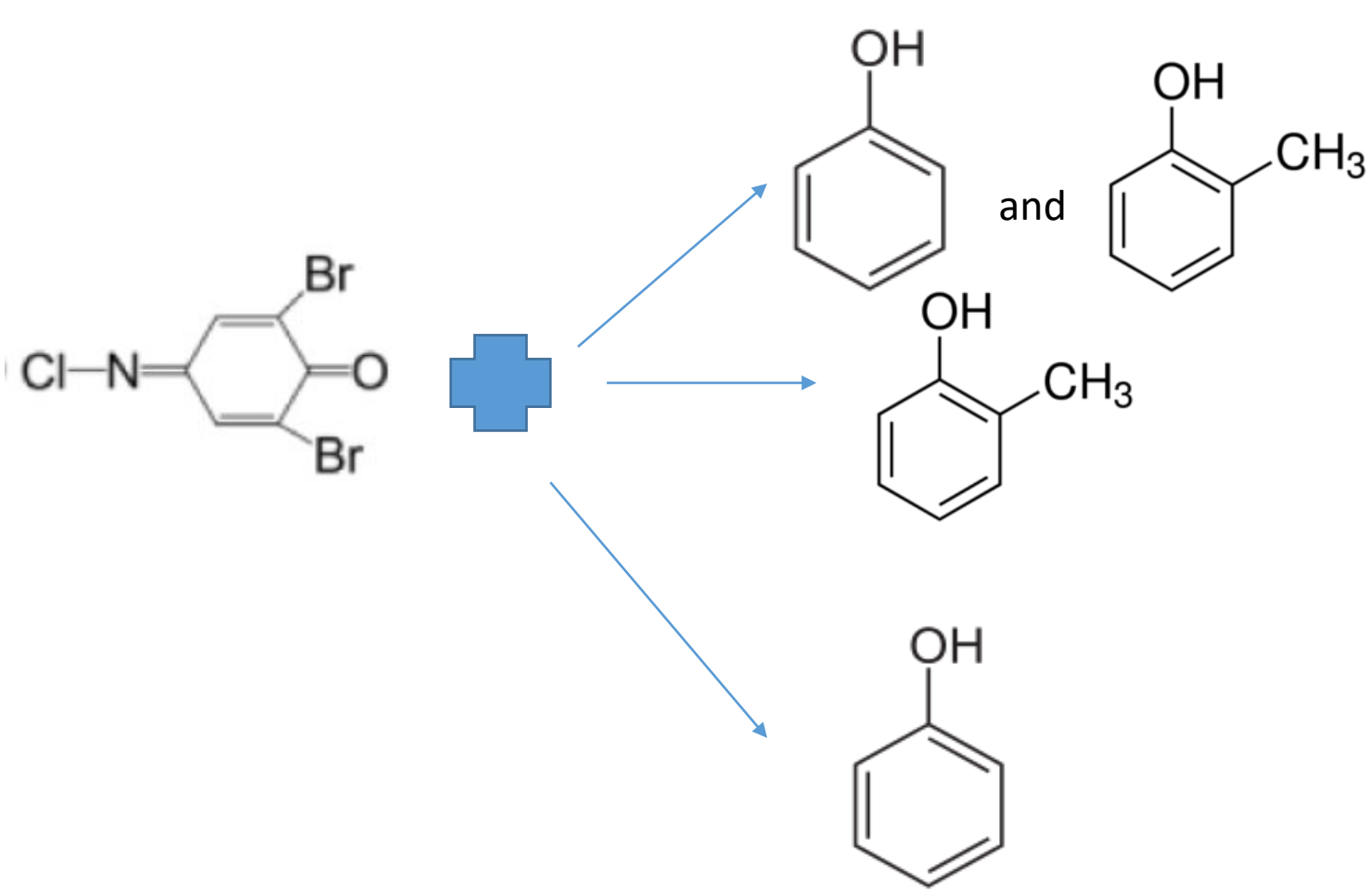

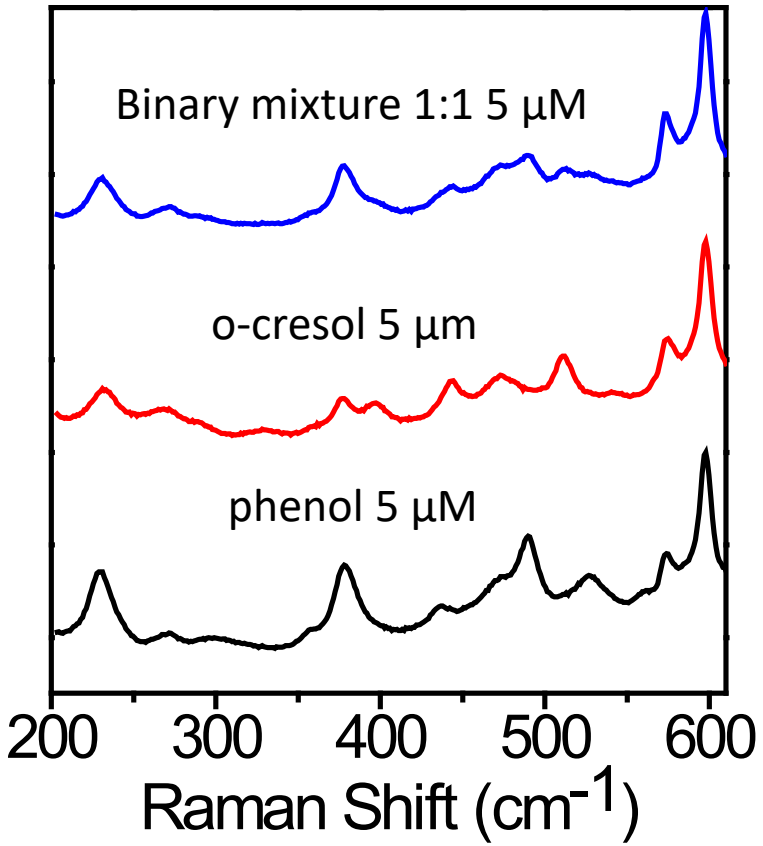

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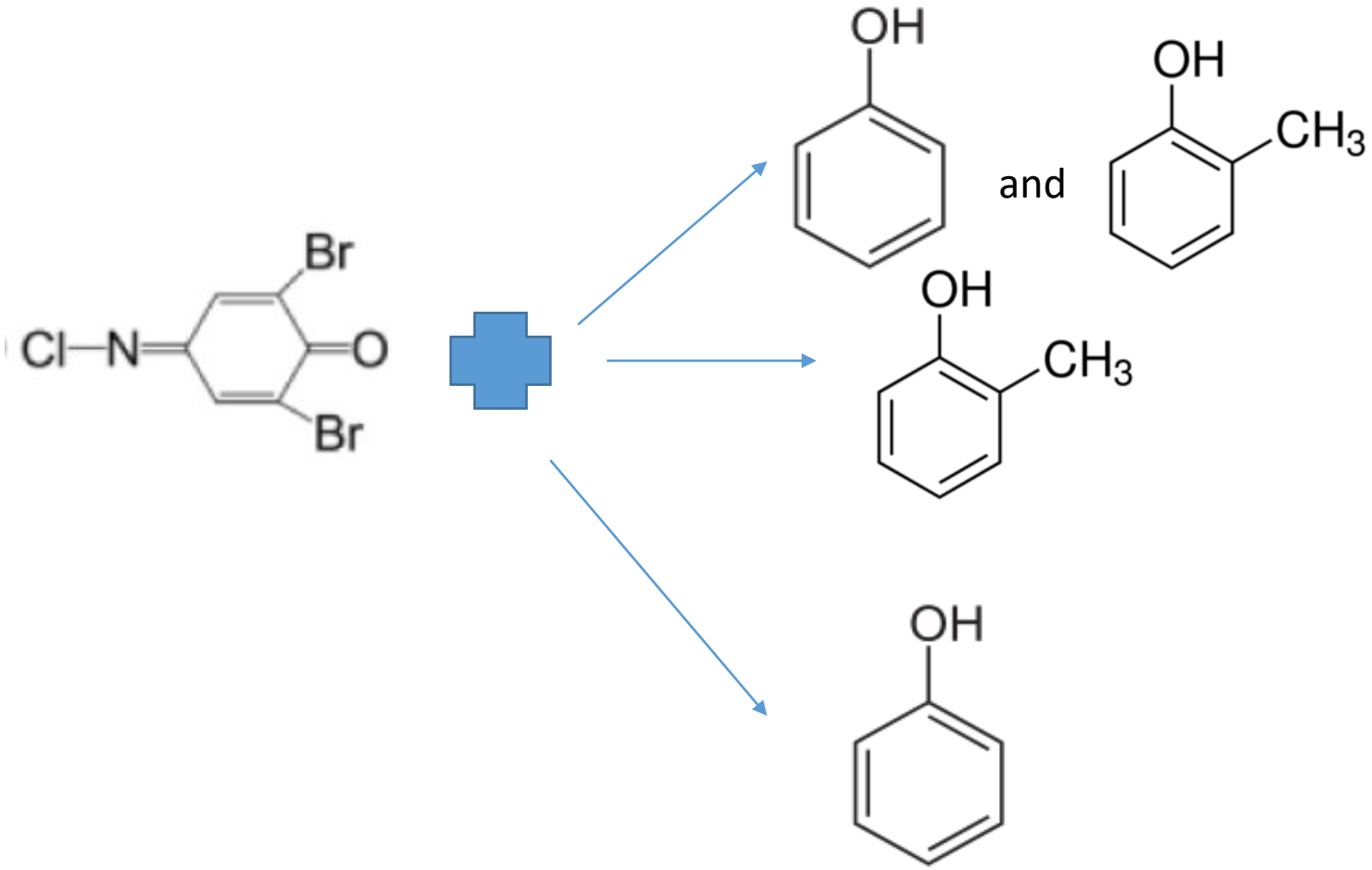
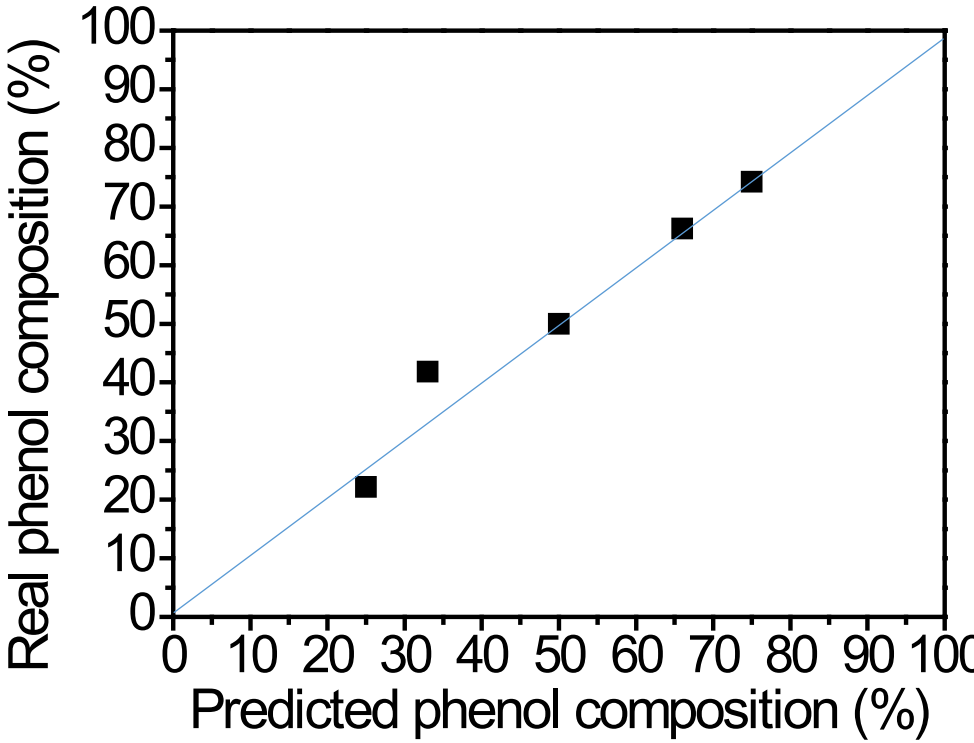
phenol/ o-cresol Binary Mixture





CONCLUSIONS

1) This method allow to quantify the amount of this 3 phenol derivatives, and to differenciate between them.

2) This method allow to perform a semi-quantitative determination of binary mixtures.

3) We purpose that this experiment could be a new step in the rapid-screening of contamination in water.

On going work:

-Semiquantitative detection of ternary mixtures.

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Universidade Vigo

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