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Gelatin Carbon Dot as Sensors for Pesticide Using Fluorescence Monitoring

Mayara M. Caetano[1] and Renata G. de Lima[2]

[1] Instituto de Química (IQ), Universidade Federal de Uberlândia (UFU), Uberlândia, Brasil
[2]Instituto de Ciências Exatas e Naturais do Pontal-ICENP, Universidade Federal de Uberlândia (UFU), Ituiutaba, Brasil

E-mail: mayara.caetano@ufu.br

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Sensors based on fluorescence-emitting carbon dots (CDs) for monitoring pesticides have attracted attention in studies[1]. This study aimed to evaluate five different CDs, derived from carbonaceous precursor (gelatin) and hydrothermal methodology (muffle furnace at 200 °C for 3 hours), varying the percentage of the solvents: **CDs 1** (100% H_2O), **CDs 2** (80% H_2O: 20% ethanol), **CDs 3** (50% H_2O: 50% ethanol), **CDs 4** (20% H_2O: 80% ethanol) and **CDs 5** (0% H_2O: 100% ethanol). The CDs were purified by centrifugation (4500 rpm for 15 minutes) and after using the syringe filter (0.2 µm). **CDs 1** and **CDs 2** presented λ_{em}= 295 nm and 420 nm, the other presented only at λ_{em}= 420 nm. Quantum yields under λ_{ex}= 240 nm obtained using quinine sulfate as standard showed a little variation between the samples and a maximum value of 22% for **CDs 3.** The sensitization performance from CDs for pesticide thiamethoxam (THI) measured the fluorescence emission. In the sensing studies, it was possible to gradually observe the suppression of fluorescence 420 nm (λ_{ex}= 250 nm) of all the CDs when increasing concentrations of THI. The fluorescence quenching mechanism, probably, can be assigned to inner filter effects, considering that THI shows electronic absorption at 250 nm (Fig. 1A). The quenching efficiency (F_0-F/F_0) presented two regions good linear relationship the all CDs. The **CDs 5** presented the best result, (R^2 = 0.992) for the linear range 0.0020 – 0.0080 mg/mL of THI and (R^2 = 0.978) for the linear range 0 – 0.0001 mg/mL (Fig. 1B).

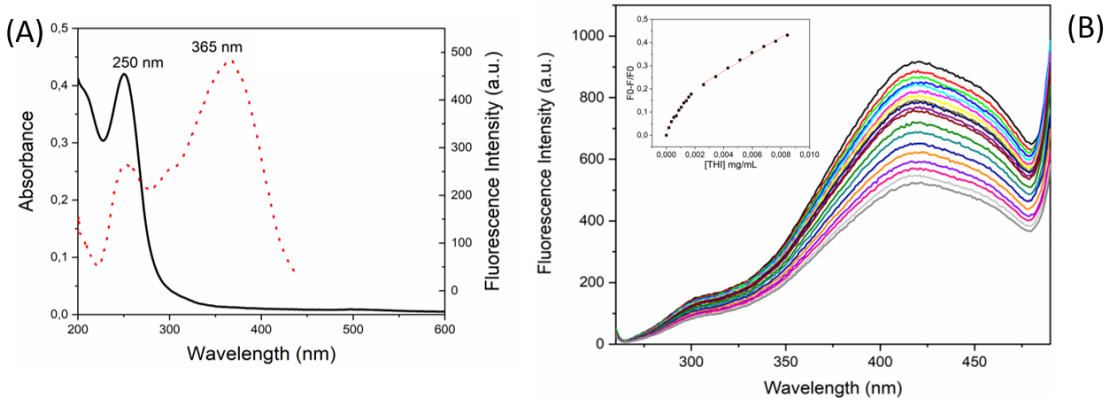

Figure 1. UV-visible spectrum of THI (black line) and excitation fluorescence spectrum of **CDs 5** (red line) (A). Fluorescence emission spectra of **CDs 5** in the presence of THI (0 – 0.008 mg/mL) under λ_{ex}= 250 nm in BR buffer solution at pH=7 (B).

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References

[1] S. Wahyudi, et al. *Sens. Bio-Sens. Res*, **41**, 100576 (2023).