DEVELOPMENT OF NOVEL FLUORESCENT MATERIALS BASED ON CORROLE DERIVATIVES FOR MOLECULAR RECOGNITION OF ANIONS

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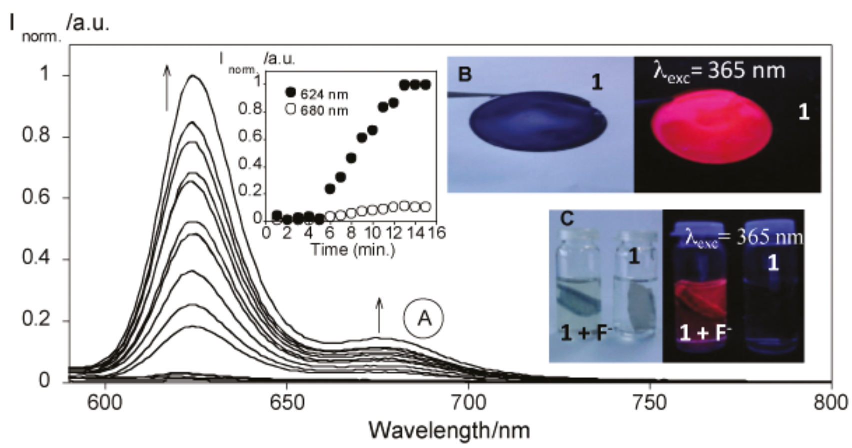
The topic of anion recognition has attracted growing interest because of its significant role in the chemical industry, environmental science and biochemistry. For instance, fluoride is an essential anion in humans in moderate levels and cyanide is one of the most active and poisonous anions. In recent years great attention has been given to the development of fluorescent materials to be used as anion chemical sensors. In terms of optical detection, certain macrocycles like the corroles represent attractive candidates for sensor elements. These tetrapyrrolic macrocycles exhibit rich spectroscopic features including: (1) high molar extinction coefficients, (2) high fluorescence quantum yields, and (3) the corrole core can accommodate a broad array of metal ions which in turn can act as active centers. In addition, corroles can be functionalized at the structural periphery to enhance binding specificity.

Recent studies of sensing ability of corroles and metallocorroles towards anions, done in collaboration with Prof. Carlos Lodeiro group from the New University in Lisbon, have demonstrated that corroles are sensitive to fluoride anions (Figure 1) being able to detect and quantify 0.35 and 0.69 ppm of F-.

In addition, this type of macrocycles shows interaction with CN- anions. However, the most promising results come from the application of these chemosensors as solid support polymers, having in mind the determination of contaminants. The non-emissive doped-polyacrylamide gel film, when exposed to water solution containing amounts of CN-, was able to detect a maximum of 1 ppm and a minimal amount of 70.0 ppb of this anion.

The polymethylmetha-crylate (PMMA) films prepared with corrole 1 show a purple colour to naked eye and under an UV lamp a very strong red emission when in the presence of F- or CN-. (Figure 2). These results are really significant for the determination of the highly toxic anion CN- in water samples.



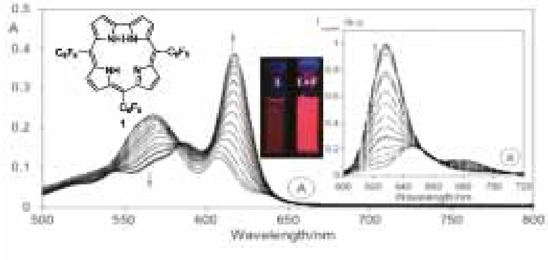


FIGURE 1

Spectrophotometric (A) and spectrofluorimetric (B) titrations of corrole 1 with the addition of F- in toluene

FIGURE 2

(A) Emission spectra with time of acrylamide gel dopped with corrole 1 in the presence of F-. (B) PMMA film with 1 and (C) polyacrilamide gel of 1 in the presence of F-.