

New Derivatives 7-(diethylamino)quinolin-2-(1H)-one Based Chalcone Colorimetric Probes for Detection of Bisulfite Anion in Cationic Micellar Media

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Abstract : Bisulfite ion (HSO_3^-) has been used as a preservative in food, drinks, and medication. However, it is well-known that HSO_3^- can cause health problems like asthma and allergic reactions in people. Due to the above, the development of analytical methods for detecting this ion has gained great interest. In line with the above, the current use of colorimetric and/or fluorescent probes as a detection technique has acquired great relevance due to their high sensitivity and accuracy. In this context, 2-quinolinone derivatives have been found to possess promising activity as antiviral agents, sensitizers in solar cells, antifungals, antioxidants, and sensors. In particular, 7-(diethylamino)-2-quinolinone derivatives have attracted attention in recent years since their suitable photophysical properties become promising fluorescent probes. In Addition, there is evidence that photophysical properties and reactivity can be affected by the study medium, such as micellar media. Based on the above background, 7-(diethylamino)-2-quinolinone derivatives based chalcone will be able to be incorporated into a cationic micellar environment (Cetyltrimethylammonium bromide, CTAB). Furthermore, the supramolecular control induced by the micellar environment will increase the reactivity of these derivatives towards nucleophilic analytes such as HSO_3^- (Michael-type addition reaction), leading to the generation of new colorimetric and/or fluorescent probes. In the present study, two derivatives of 7-(diethylamino)-2-quinolinone based chalcone DQD1-2 were synthesized according to the method reported by the literature. These derivatives were structurally characterized by ^1H , ^{13}C NMR, and HRMS-ESI. In addition, UV-VIS and fluorescence studies determined absorption bands near 450 nm, emission bands near 600 nm, fluorescence quantum yields near 0.01, and fluorescence lifetimes of 5 ps. In line with the foregoing, these photophysical properties aforementioned were improved in the presence of a cationic micellar medium using CTAB thanks to the formation of adducts presenting association constants of the order of $2.5 \times 10^5 \text{ M}^{-1}$, increasing the quantum yields to 0.12 and the fluorescence lifetimes corresponding to two lifetimes near to 120 and 400 ps for DQD1 and DQD2. Besides, thanks to the presence of the micellar medium, the reactivity of these derivatives with nucleophilic analytes, such as HSO_3^- , was increased. This was achieved through kinetic studies, which demonstrated an increase in the bimolecular rate constants in the presence of a micellar medium. Finally, probe DQD1 was chosen as the best sensor since it was assessed to detect HSO_3^- with excellent results.

Keywords : bisulfite detection, cationic micelle, colorimetric probes, quinolinone derivatives

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