Cyanide anion sensing in aqueous media using a fluorogenic sensor and anion identification system developing from colorimetric sensors from 3,6-disubstituted carbazole derivatives

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Abstract: 3,6-Dicyanocarbazole (DCC) was used as a fluorogenic sensor for detection of -1 charge anions including CN, F, AcO, H2PO4, BzO, NO3, HSO4, Cl, ClO4, Br and I in different solvent media; MeCN, MeOH, DMSO, H2O:MeCN (1:9, 2:8, 3:7, 4:6), H2O:DMSO (1:9, 2:8, 3:7, 4:6) and MeOH:DMSO (1:1). Results from naked eye observation and fluorescence revealed that DCC in MeOH and H2O:MeCN (3:7) showed the highest selectivity with CN (a strong base anion) by turning on a blue light at 450 nm. The lowest concentration of CN which could be detected by DCC was determined as the value of 10 ppm and 2.6 ppm from naked eye observation and fluorescence technique, respectively. DCC solution in H2O:MeCN (3:7) could detect cyanide ion at a lower concentration than DCC in MeOH. In addition, four colorimetric sensors from 3,6-disubstituted carbazole compounds; 3-nitrocarbazole (MNC), 3,6 dinitrocarbazole (DNC), 3,6-dibromocarbazole (DBC) and 3-nitro,6-bromocarbazole (NBC) which prepared in appropriated solvents were developed to obtain a selective anion identification system. A combination of DNC in DMSO, DNC in H2O:MeCN (1:4), MNC in MeCN, DBC in DMSO and NBC in DMSO could be able to identify CN, F and AcO from other anions.

Keywords: 3,6-Disubstituted carbazole; Fluorogenic sensor; Colorimetric sensor; Anion sensor