

Visual Detection of Fluoride ions by a Simple Chromogen, Bromothymol Blue Diacetate

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This study describes a simple, new, method for the detection and determination of fluoride using a novel chromogen, bromothymol blue diacetate abbreviated as BTBDA. Previously unknown chromogen, BTBDA was designed and synthesized in high yield. The detection of fluoride is based on the removal of acetate groups by fluoride ions in aqueous medium without interference from other common anions. The reaction of BTBDA with fluoride ion was investigated by UV-vis spectroscopy. BTBDA in water (pH ~ 6.0) showed the colour change from pale yellow to intense blue upon addition of fluoride ion due to substantial bathochromic shift of λ_{\max} . (415 to 618 nm). No significant colour change was observed upon addition of a few other anions such as Cl^- , Br^- , I^- and ClO_3^- . Fluoride ion triggered dramatic change of absorption band and colour show that BTBDA is highly selective towards the fluoride ion over other selected anions. The absorbance at $\lambda_{\max} = 618$ nm exhibited by the dianion increased linearly with increasing fluoride ion concentration. Therefore, BTBDA derived from readily available simple acid base indicator, allows naked-eye detection of fluoride ions in aqueous medium. Under experimental conditions used, calibration graph was linear with the correlation coefficient of ($r^2 = 0.994$) in water. The most promising feature of this new chromogen is its ability to respond to fluoride ions in aqueous medium compare to the structurally similar chromogen, phenolphthalein diacetate which is reactive towards fluoride ions only in organic media.

Key words: *fluoride ions, bromothymol blue, water, spectrophotometry*

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