

**SYNTHESIS OF IRON(III)-NAPHTHYLACETOHYDROXYMATE
COMPLEX AS CHELATION-ENHANCED FLUORESCENCE
SENSOR FOR DETERMINATION OF FLUORIDE IONS**

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Fluoride is a toxic ion and levels above 2 ppm in drinking water cause chronic fluoride poisoning. It has been reported that the drinking water available in the dry zone has fluoride levels higher than 4 – 6 ppm, which is higher than the WHO recommended level of 1.5 ppm. Therefore, there is a great need to introduce a cost effective or portable device to detect the fluoride concentration in a critical analyte system. The present study discusses a Chelation Enhanced Fluorescence Sensor developed for the determination of trace level fluoride ions.

Naphthylacetohydroxamic acid and iron(III)-naphthylacetohydroxamate complex were synthesized using standard procedures. It was found that with the complexation of iron(III) the fluorescence of naphthylacetohydroxamic acid has been quenched. The characteristic UV absorbance of naphthylacetohydroxamic acid was found to be 267 nm while its emission wave length was found to be at 340 nm. With the increase of the metal ion the emission intensity reduced because the amount of the unbound form of the probe (Naphthylacetohydroxamic acid) had decreased.

When fluoride is added to iron(III)-naphthylacetohydroxamate complex it dissociates to release unbound naphthylacetohydroxamic acid in the solution and results in the formation of the most stable FeF_3 complex. The unbound naphthylacetohydroxamic acid enhances the fluorescence.

The versatility of the application of this novel probe was assessed by different synthetic and real sample matrices and compared with ion selective electrode measurements under the same optimum conditions. No significant interference was observed with co-existing common ions competing with the fluorescence intensity. The traditional methods of ion selective electrode were not able to detect fluoride ions at concentrations below 0.05 ppm. It was found that the iron(III)-naphthylacetohydroxamate probe could be successfully applied to a much less fluoride concentration (0.005 ppm).

In this study it was found that the iron(III)-naphthylacetohydroxamate probe with a concentration of $7.6 \times 10^{-7} \text{ mol dm}^{-3}$ was able to detect fluoride ion concentration of $9.4 \times 10^{-9} \text{ mol dm}^{-3}$ at pH = 4. The tolerance limit for interferences of other co-existing common ions on emission intensity was found to be $2.43 \times 10^{-7} \text{ mol dm}^{-3}$.

Keywords: Chelation Enhanced Fluorescence Sensor, Fluoride, Hydroxamic acid

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