Fluoride

For water and seawater

SPADNS, SPADNS 2 and Ion-selective Electrode Methods

Introduction

Fluoride occurs naturally in some ground waters, and a 1-mg/L level is normally maintained in public drinking water supplies for the prevention of dental cavities. Excessive amounts of fluoride cause an objectionable discoloration of tooth enamel called “mottling”. For this reason, a permissible level in drinking water has been established by the USEPA in accordance with the Safe Drinking Water Act.

Chemical reactions

SPADNS method

The fluoride analysis involves the reaction of fluoride with a dark red zirconium-dye complex. Fluoride combines with part of the zirconium to form a colorless zirconium-fluoride complex with the net effect of bleaching the color. Measurement of the decrease in color intensity provides an accurate determination of the fluoride concentration. The SPADNS Method is the preferable colorimetric method due to its rapid reaction with fluoride and the stability of the SPADNS reagent.

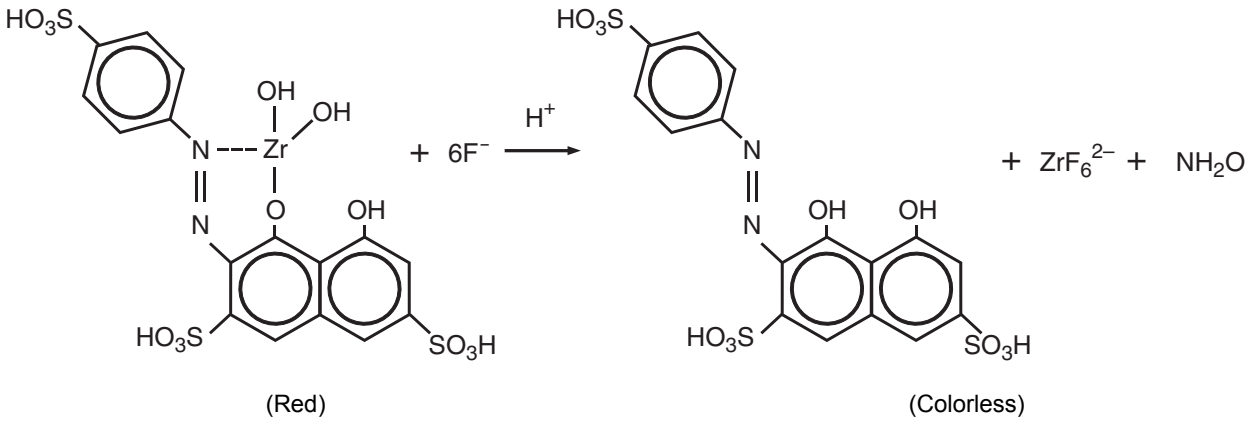

Figure 1 Chemical reaction for SPADNS method

SPADNS 2 method

Sodium Arsenite is used in the SPADNS method as a reducing agent to prevent interference from chlorine and other oxidants that are typically present in drinking water. The SPADNS 2 test eliminates arsenic from the original SPADNS formulation by using a non-toxic proprietary reducing agent to achieve identical results and test performance. All other chemistry remains the same as the SPADNS method.

Method of analysis

Ion-Selective electrode method

The Ion-Selective electrode method requires a Hach sens***ion***™ ISE Meter and an electrode system consisting of a silver/silver chloride reference electrode and a standard fluoride ion-selective electrode. Fluoride measurement is accomplished when a voltage potential is established across the lanthanum fluoride crystal on the end of the electrode; this potential is in direct proportion to the fluoride concentration of the sample. The meter is calibrated with fluoride standards bracketing the expected range. The concentration may be read directly from the meter. A total ionic strength adjustment buffer (TISAB) is used to eliminate interferences in the test, to adjust the pH to an optimum value and to introduce sufficient sodium chloride to mask variations in

ionic strength. TISAB reagent uses sodium 1,2-cyclohexanediaminetetraacetic acid (CDTA) for chelation of interfering metals, such as Al^{3+} and Fe^{3+}, as well as other complexing and buffering agents.