Boron

For water and wastewater **Azomethine-H and Carmine Methods**

Introduction

Boron normally occurs in natural waters at concentrations less than 1.0 mg/L. Boron in natural water could be an indicator of sanitary pollution from domestic wastewater, usually in the form of borates from laundry detergents. In water for human consumption, boron concentrations typically should be less than 300 µg/L. Large amounts of boron can affect the central nervous system; when continually ingested over an extended period of time boron can cause a syndrome called borism.

In the semiconductor industry, boron has been used as an indicator of ion-exchange resin exhaustion in wafer rinsewater treatment. Boron is routinely monitored in irrigation water since many varieties of plants are sensitive to excess boron.

Analytical colorimetric methods for boron include the Curcumin Method, the Carmine Method and the Azomethine-H Method.

Chemical reactions

Azomethine-H method

The Azomethine-H Method involves the coupling of H-acid with an aromatic hydroxyaldehyde, such as salicylaldehyde, due to the catalytic effect when boron is present. At neutral pH values and a controlled temperature, the condensation reaction is completed quickly (within 15 minutes). After product formation, the solution is adjusted to an acidic pH for optimum color measurement at 410 nm (yellow) using a colorimeter or spectrophotometer. The method is sensitive and highly selective for the determination of dissolved boron in water.

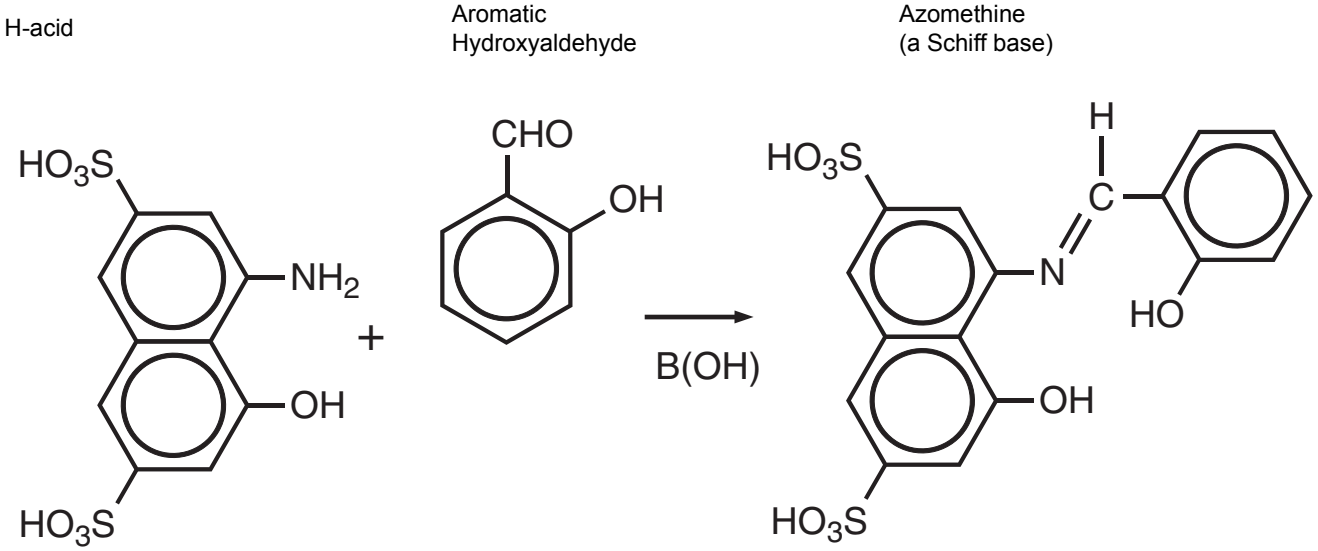
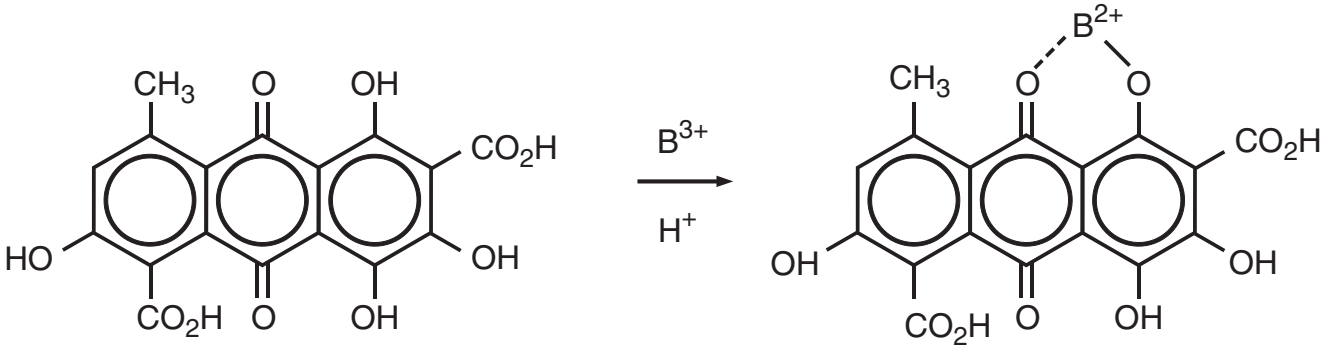


Figure 1 Chemical reactions for the Azomethine-H method

Carmine method

In the presence of concentrated sulfuric acid, boron exists as the cation B^{3+}. The cation complexes to the carmine indicator causing the solution to change color from red to blue.

The blue-colored complex is read at 605 nm using a spectrophotometer, and the amount of color is proportional to the dissolved boron concentration.



Carmine

Boron—Carmine Complex

Figure 2 Chemical reactions for the Carmine method