Manganese

For water and wastewater

Periodate Oxidation and PAN Methods

Introduction

Manganese is present in ground waters primarily as the divalent ion (Mn^{2+}), due to the lack of subsurface oxygen. Surface waters may contain combinations of manganese in various oxidation states as soluble complexes, or as suspended particles.

The occurrence of manganese in public water supplies presents more of an economic problem than a potential health hazard. Manganese causes dark stains in laundry and on plumbing fixtures, tends to deposit in water lines, and imparts an objectionable taste to beverages such as coffee and tea. Manganese levels in natural waters rarely exceed 1 mg/L, but levels of 0.1 mg/L are sufficient to cause the taste and staining problems. The recommended allowable manganese level in public water supplies is 0.05 mg/L.

Two methods for manganese determination are used in test procedures. The Periodate Oxidation Method gives a simple, rapid test for high levels of manganese. The 1-(2-Pyridylazo)-2-Napthol (PAN) Method is a sensitive, rapid procedure for low levels of manganese.

Chemical reactions

Periodate oxidation method
Manganese is oxidized to permanganate using periodate in a slightly acidified water sample. No indicator is necessary. Intensity of the purple color of the permanganate ion is a direct indication of the amount of manganese present in the sample.

$$3H_2O + 2Mn^{2+} + 5IO_4^- \rightarrow 2MnO_4^- + 5IO_3^- + 6H^+$$

PAN method
The PAN method employs an Alkaline-Cyanide Reagent. PAN Indicator is added and forms an orange-red colored complex with the manganese ion.

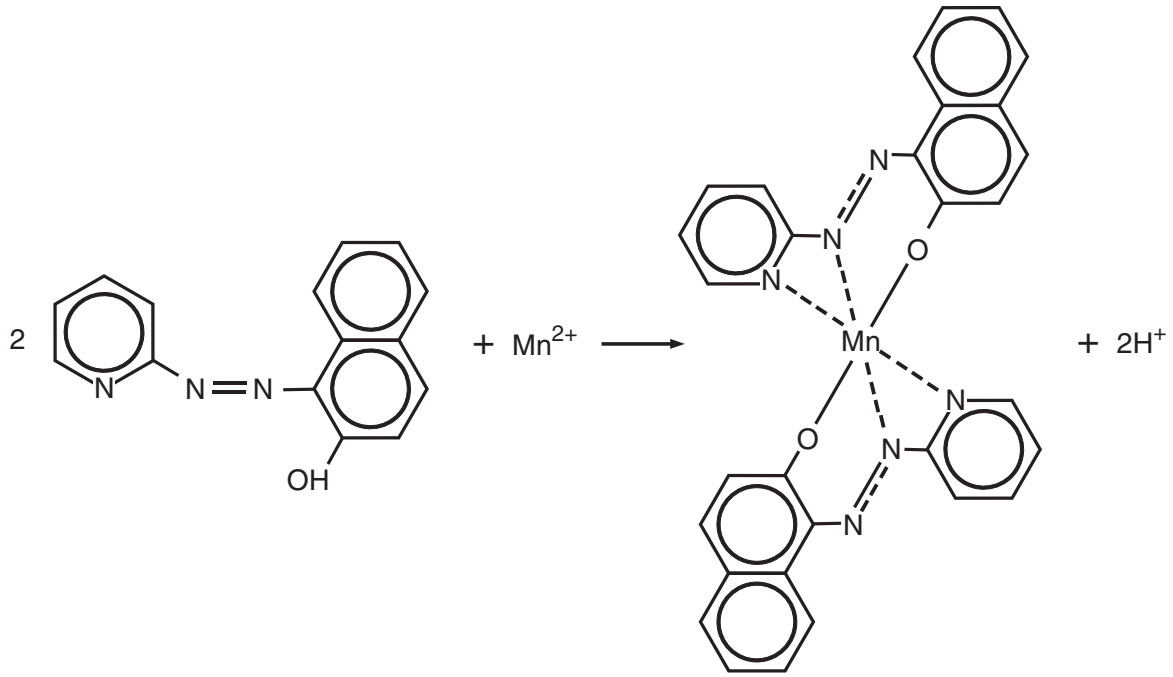

Figure 1 Chemical reaction for PAN method

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