

**Summary:** Within the pH range of 2.5–3.0, sulfate ions react with a barium-methylthymol blue (BaMTB) complex to form barium sulfate ( $\text{BaSO}_4$ ) and free methylthymol blue (MTB). The analytical stream is then made highly basic (pH 12.5–13.0). At this pH, the absorbance maximum for the BaMTB complex is 610 nm while that of free MTB is 460 nm. Given that the molar concentrations of barium and MTB are approximately equal and that the maximum sulfate concentration to be measured does not exceed the concentration of the BaMTB complex, the sulfate concentration is directly proportional to the free MTB concentration measured at 460 nm.

**Interferences:** Multivalent cations such as calcium, magnesium, and aluminum are removed with a cation exchange column. Neutralize samples with pH values less than 2 to prevent the elution of cations from the ion exchange resin. Filter or centrifuge turbid samples prior to analysis.

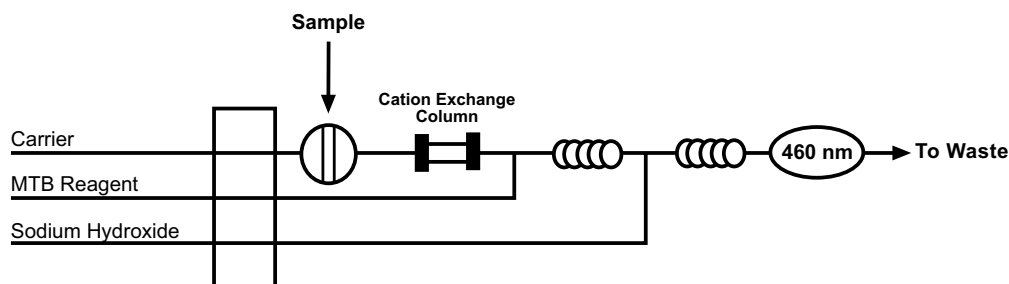
**Performance Specifications:**

Range:	2.0–200 mg/L
Throughput:	55 samples/hour
Precision:	
40 mg/L	<3% RSD
160 mg/L	<2% RSD
Method Detection Limit (MDL):	1.61 mg/L

**Chemicals:**

Ammonium Chloride, $\text{NH}_4\text{Cl}$	Ethanol, 95%, $\text{C}_2\text{H}_5\text{OH}$
Ammonium Hydroxide, $\text{NH}_4\text{OH}$	Ethylenediaminetetraacetic Acid Disodium Salt Dihydrate (EDTA), $\text{C}_{10}\text{H}_{14}\text{N}_2\text{O}_8\cdot\text{Na}_2\cdot 2\text{H}_2\text{O}$
Barium Chloride Dihydrate, $\text{BaCl}_2\cdot 2\text{H}_2\text{O}$	Hydrochloric Acid, concentrated, HCl
Bio-Rex <sup>®</sup> 70 Resin, 50–100 dry mesh size, sodium form	Methylthymol Blue Sodium Salt, $\text{C}_{37}\text{H}_{43}\text{N}_2\text{O}_{13}\cdot\text{NaS}$
Brij <sup>®</sup> -35, 30% w/v (OI Analytical Part #A21-0110-33)	Sodium Hydroxide, NaOH
Chloroform, $\text{CHCl}_3$	Sodium Sulfate, $\text{Na}_2\text{SO}_4$

**Basic Flow Diagram:**



**Selected References:** *Methods for the Determination of Inorganic Substances in Environmental Samples*; EPA-600/R-93/100; U.S. Environmental Protection Agency, Office of Research and Development, Environmental Monitoring and Support Laboratory: Cincinnati, OH, 1984; Method 375.2.

*Standard Methods for the Examination of Water and Wastewater*, 20th ed.; American Public Health Association: Washington, D.C., 1998; Method 4500-Sulfate.

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