

# Sulfate Vacu-vials® Kit

K-9203: 0 - 100.0 ppm (Prog. # 174)

## Instrument Set-up

The following method revisions are required: Method Rev. 20 (V-2000) and Software Ver. 2.72/Program Ver. 2.09C (V-3000).

For CHEMetrics photometers, follow the **Setup and Measurement Procedures** in the operator's manual. For spectrophotometers, follow the manufacturer's specifications to set the wavelength to **420 nm** and to zero the instrument using the ZERO ampoule supplied.

Different instrument platforms vary widely in their ability to measure turbidity. Since this method is a turbidimetric determination, the calibration equation is for reference only. It is strongly recommended that sulfate standards be run to validate the calibration equation or to generate an instrument specific calibration.

## Sample Temperature

Sample temperatures that deviate significantly from 20°C (68°F) may introduce test result bias.

## Sample Pre-treatment

If the sample is turbid, it must be filtered prior to performing this test procedure.

## Test Procedure

1. Fill the sample cup to the 20 mL mark with the sample to be tested (fig. 1).
2. Add 7 drops of S-9200 Acidifier Solution (fig. 2). Stir to mix the contents of the cup.

**NOTE:** The appearance of bubbles on the side and bottom of the sample cup is an indication of extremely high alkalinity levels, (>2000 ppm as CaCO<sub>3</sub>). Under these conditions stir the sample for approximately 1 minute to allow this gas to be dispersed.

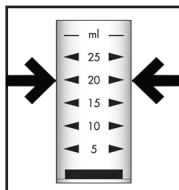


Figure 1

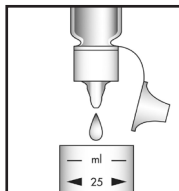


Figure 2

3. Add 1 scoop of S-9202 Activator Powder to the sample. Stir for **10 seconds**.

**NOTE:** It is not critical that all of the crystals dissolve. However, it is important to remove any excess crystals from the sample cup before running another test.

4. Place the Vacu-vial ampoule, tip first, into the sample cup. Snap the tip. The ampoule will fill leaving a bubble for mixing (fig. 3).
5. To mix the ampoule, invert it several times, allowing the bubble to travel from end to end.
6. Dry the ampoule. Obtain a test result **1 minute** after snapping tip.
7. Insert the Vacu-vial ampoule into the photometer, flat end first, and obtain a reading in ppm (mg/Liter) sulfate (SO<sub>4</sub>).

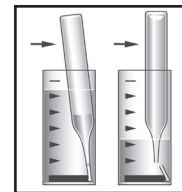


Figure 3

**NOTE: If using a spectrophotometer** that is not pre-calibrated for CHEMetrics products and an instrument specific calibration has not been generated as recommended, then use the **equation below** or the **Concentration Calculator** on the website.

$$\text{ppm} = 251.9(\text{abs})^3 - 377.7 (\text{abs})^2 + 274.4 (\text{abs}) + 3.1$$

## Test Method

The Sulfate Vacu-vials®<sup>1</sup> test kit employs the turbidimetric method.<sup>2,3,4</sup> Sulfate ion reacts with barium chloride in an acidic solution to form a suspension of barium sulfate crystals of uniform size. The resulting turbidity is proportional to the sulfate concentration of the sample.

1. Vacu-vials is a registered trademark of AquaPhoenix Scientific, LLC U.S. Patent No. 3,634,038.
2. APHA Standard Methods, 15<sup>th</sup> ed., Method 426 C (1980).
3. EPA Methods for Chemical Analysis of Water and Wastes, Method 375.4 (1983).
4. ASTM D 516 - 07, Sulfate Ion in Water.

## Safety Information

Read SDS before performing this test procedure. Wear safety glasses and protective gloves.