

TECHNICAL DATASHEET Silica (SiO₂) analysis

Process Colorimetric Analyser PCA200-Si



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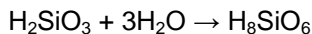
Measurement method:

Analytical procedures for silica include the Silicomolybdate Method for high range measurement and the Heteropoly Blue Method for low range measurement. The Heteropoly Blue method is an extension of the Silicomolybdate method to increase sensitivity.

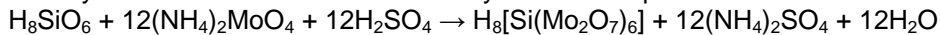
The Silicomolybdate Method involves the reaction of molybdate ion with silica and phosphate under acid conditions to form a yellow colour. Oxalic acid is added to destroy the phosphomolybdic acid complex (the yellow colour formed due to phosphate), but not the silicomolybdic acid complex. For large amounts of silica, the remaining yellow colour is intense enough to be read directly (measured in a spectrophotometer at a wavelength of 410 nm according to the Standard Methods Molybdosilicate Method 4500-SiO₂ C).

For low concentrations, an amino-naphthol sulfonic acid reducing agent is used to convert the faint yellow colour to a dark heteropoly blue species. The colour formed is directly proportional to the amount of silica present in the original sample. A colorimetric measurement at a wavelength of 815 nm (according to the Standard Methods Heteropoly Blue method 4500-SiO₂ D) of this intensity provides an accurate means of determining the silica concentration. Some forms of silica (usually polymeric) will not react with ammonium molybdate and must be digested with sodium bicarbonate to be converted to a reactive form.

Silicic acid reacts with water and hydrates as follows:



This hydrated silicic acid reacts with molybdate in the presence of acids to form silicomolybdic acid:



This silicomolybdic acid is then reduced to a blue colour (heteropoly species) by an amino naphthol sulfonic acid for low concentrations.

Reagents:

The required reagents for the measurement are:

- ✓ Hydrochloric Acid - HCl 1+1.
- ✓ Ammonium Molybdate – (NH₄)₆Mo₇O₂₄ 4H₂O.
- ✓ Oxalic Acid – H₂C₂O₂ H₂O.
- ✓ 1-Amino-2-Naphthol-4-Sulfonic Acid + Na₂SO₃ + NaHSO₃.

Measurement range:

0 to 20 mg/L SiO₂.

Detection limit:

- ✓ 5 ppb with the Heteropoly Blue Method 4500-SiO₂ D
- ✓ 100 ppb with the Molybdosilicate Method 4500-SiO₂ C

Interference:

Because both apparatus and reagents may contribute silica, avoid using glassware as much as possible and use reagents low in silica. In both methods C and D, tannin, large amounts of iron, colour, turbidity, sulfide, and phosphate interfere. Treatment with oxalic acid eliminates interference from phosphate and decreases interference from tannin. If necessary, use photometric compensation to cancel interference from colour or turbidity.

Specifications

Analytical method	Colorimetric method
Range	0 to 20 mg/L SiO ₂
Accuracy	+/- 5% of full scale
Minimum measuring interval	15 - 30 min. Application dependent
Sample pressure	Up to 4 bars with sampling valve < 0.2 bar with sampling pump
Sample flow rate	Typical 0.2 to 0.5 L/mn
Sample temperature	0.5 – 60 °C (sample cooler available as an option)
Optical system	2-Wavelengths photometer
Sample input/output	Input: w/ sampling pump : Fast connectors for silicone tube 6.4 mm inner diameter. w/ sampling valve : Double ring connector for 12 mm external tube diameter Output : Fast connectors for silicone tube 6.4 mm inner diameter
Power supply	110-120 V/ 220-240V 50/60 Hz 30 VA Internal battery 12 V
Outputs	Four 4-20 mA insulated outputs, 12 bits resolution High/low level alarm relays (potential free, NC/NO) Analyser fault alarm relay (potential free, NC/NO) Mains presence relay (potential free, NC/NO)
Communication	RS232/485 for PC, modem or MODBUS
Environmental conditions	Rel. Humidity : 5 – 95% (not condensing) Temperature : 10 – 40 °C
Housing:	Watertight IP66 Painted steel box
Weight	+/- 30 Kg

Dimensions

← 297 mm →

← 585 mm →

