Flow Solution™ FS 3700 Automated Chemistry Analyzer

Methylene Blue Active Substances (MBAS) Index using Continuous Flow Analysis ISO 16265

Cartridge Part Number 330358CT

Scope and Application

This method is used for the determination of the methylene blue active substances (MBAS) index in drinking water, ground water, surface water, domestic and industrial wastes according to **ISO Method 16265**. Anionic surfactants are the most important substances showing methylene blue activity. This method is, therefore, useful for estimating the anionic surfactant content (e.g. soaps) of water.

Method Performance

Range	0.025 - 2.0 mg/L as LAS
Rate	24 samples/hour
Precision	<5% RSD at mid-point of range
Method Detection Limit (MDL)	0.008 mg/L as LAS

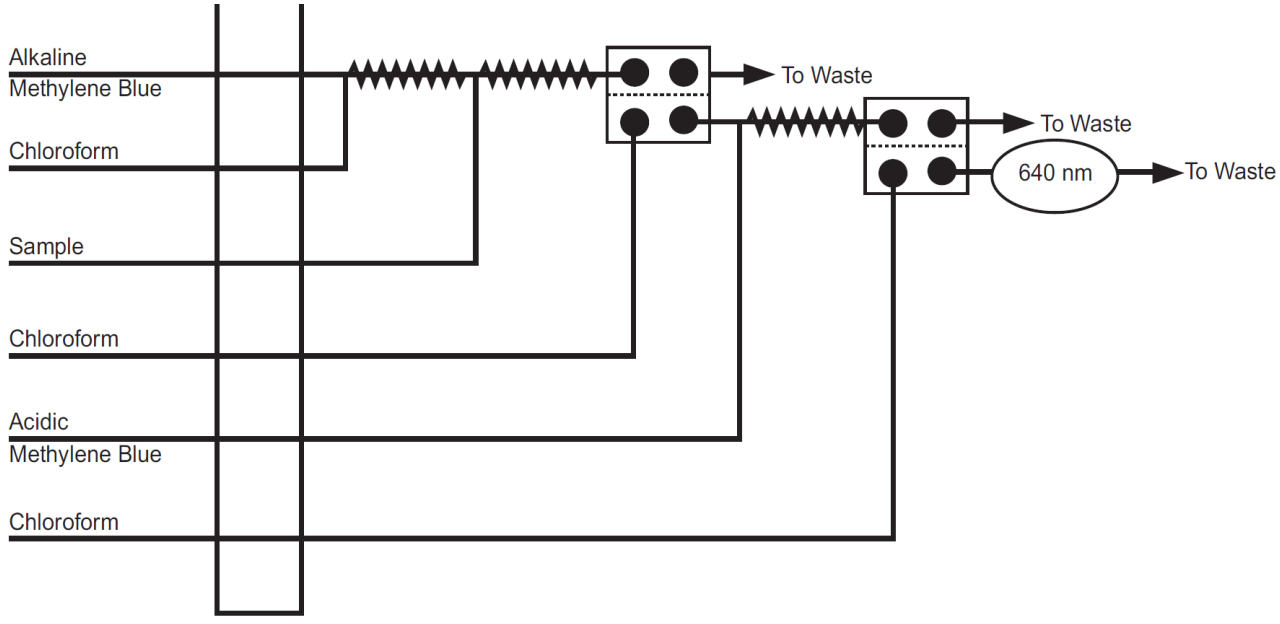


Figure 1. General Flow Diagram for Methylene Blue Active Substances by ISO 16265

Reagents and Calibrants

Chemical Name	CAS #	Chemical Formula	Part Number
Boric acid	10043-35-3	H_3BO_4	
Brij®-35	9002-92-0	$(C_2H_4O)_nC_{12}H_{26}O$	326126
Chloroform	67-66-3	$CHCl_3$	
Ethanol	64-17-5	C_2H_6O	
Hydrochloric acid	7647-01-0	HCl	
Isopropyl alcohol	67-63-0	C_3H_8O	
Methylene blue	7220-79-3	$C_{16}H_{18}N_3SCl$	
Petroleum ether	8032-32-4		
Sodium dodecylbenzenesulfonate	25155-30-0	$CH_3(CH_2)_{11}C_6H_4SO_3Na$	
Sodium dodecyl sulfate	151-21-3	$CH_3(CH_2)_{11}OSO_3Na$	
Sodium hydroxide	1310-73-2	NaOH	
Sodium phosphate, monobasic	7558-80-7	NaH_2PO_4	
Sulfuric acid, concentrated	7664-93-9	H_2SO_4	
Water, deionized		H_2O	
Additionally, the following chemical may be needed for sample preservation or treatment.			
Formaldehyde	50-00-0	CH_2O	

Summary of ISO 16265

Method

1. When such anionic surfactants are mixed with an alkaline methylene blue solution, an ion pair is formed. In mixtures of chloroform and water, the ion pairs will extract into the chloroform layer, transferring the blue color into the organic phase (the unassociated dye has an extremely small solubility in chloroform). Separating the organic phase from the aqueous phase removes interferences and yields chloroform containing the extracted methylene blue-anionic complexes. The organic phase is then treated with an acidic methylene blue solution and the absorbance measured at 640 nm, which is the absorbance maximum of methylene blue in chloroform.

2. The anionic surfactants most often found in wastewater are soluble sodium salts of the alkyl sulfates and the alkyl benzene sulfonates.

3. Separation of the aqueous and organic phases can be accomplished using different methods including the use of hydrophobic membranes. For proper operation of this method, ensure that only the organic phase reaches the detector.

Interferences

1. Anionic surfactants are common components of detergents and may be present in residual amounts on laboratory glassware. Wash all glassware with dilute acid prior to usage to prevent interference from contamination.

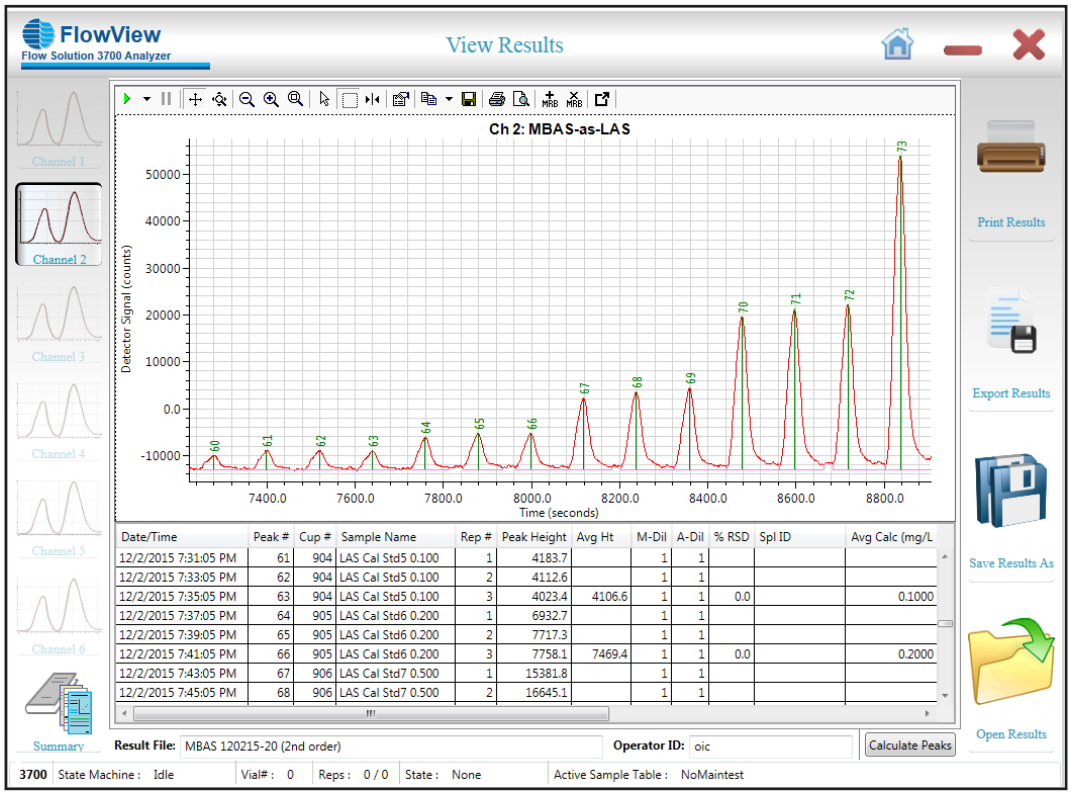
2. Methylene blue solutions must be protected from oxidizing substances.

3. Filtration of samples containing particulates may be required. As a result, some anionic surfactant loss may occur.

4. Heavy metals, cationic surfactants, or other compounds (e.g. amines) that can compete with methylene blue to form an ion pair with MBAS will reduce response.

5. High concentrations of chloride, bromide, and nitrate interfere by forming ion pairs with methylene blue. These interferences are removed using a second extraction at an acidic pH.[2]

6. Other compatible procedures for removing or suppressing interferences may be used, provided they do not adversely affect overall method performance.



Date/Time	Peak #	Cup #	Sample Name	Rep #	Peak Height	Avg Ht	M-Dil	A-Dil	% RSD	Spl ID	Avg Calc (mg/L
12/2/2015 7:31:05 PM	61	904	LAS Cal Std5 0.100	1	4183.7		1	1			
12/2/2015 7:33:05 PM	62	904	LAS Cal Std5 0.100	2	4112.6		1	1			
12/2/2015 7:35:05 PM	63	904	LAS Cal Std5 0.100	3	4023.4	4106.6	1	1	0.0		0.1000
12/2/2015 7:37:05 PM	64	905	LAS Cal Std6 0.200	1	6932.7		1	1			
12/2/2015 7:39:05 PM	65	905	LAS Cal Std6 0.200	2	7717.3		1	1			
12/2/2015 7:41:05 PM	66	905	LAS Cal Std6 0.200	3	7758.1	7469.4	1	1	0.0		0.2000
12/2/2015 7:43:05 PM	67	906	LAS Cal Std7 0.500	1	15381.8		1	1			
12/2/2015 7:45:05 PM	68	906	LAS Cal Std7 0.500	2	16645.1		1	1			

Figure 2. MBAS Calibration Series

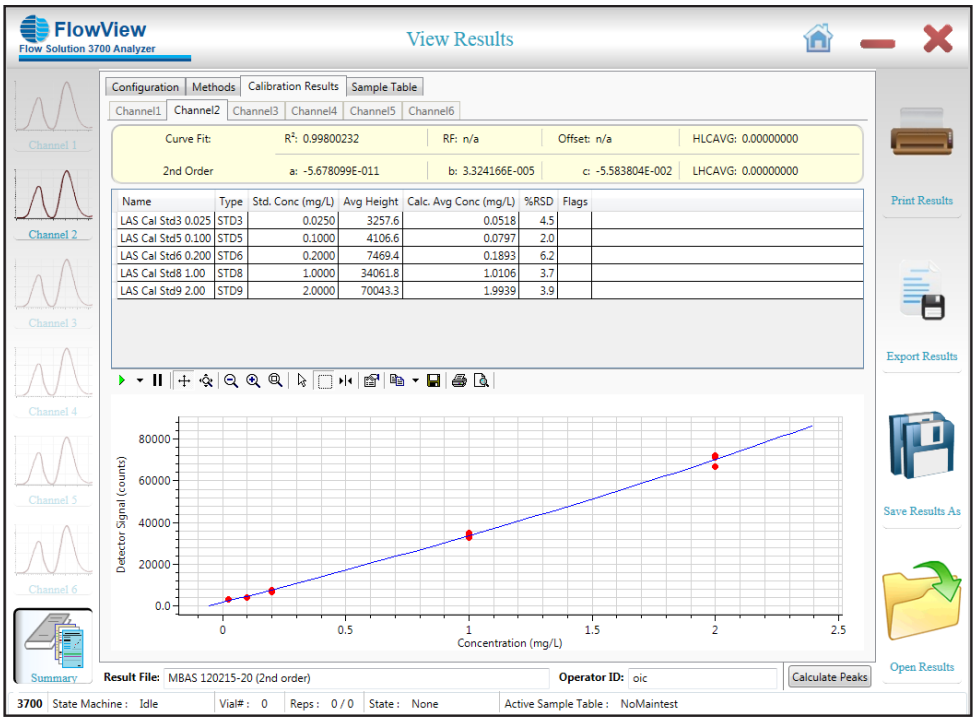


Figure 3. Calibration Curve and Statistics

Table 2. Consumables and Spare Parts for Methylene Blue Active Substances, ISO 16265

Consumables	Part Number
Pump tubes kit - Methylene Blue Active Substances, ISO 16265	330358TK
Viton® pump tube assembly – White/White	319714
Viton® pump tube assembly – Grey/Grey	319713
Sample Vials, Glass 8-mL (13 X 100 mm) (pack of 1000)	A000514
Phase Separation Membrane (5 pk)	A001520
PEEK Autosampler Probe for RA/3090/3360 Sampler	325331
Brij®-35	326126

Optional Accessories	Part Number
Teflon® Phase Separation Membrane (25 pk)	A002040
Plastic Membrane Tweezers – Wide, Flat Tip	328929
Debubbler, Polysulfone for the FS3100, FS IV, FS 3700	A000172
FS3700 8-port FIA Valve & Cable	330394
400 µL Sample Loop/Bypass Loop for 8-port valve	319334
Pump Tube Assortment Pack (2 of every-sized pump tube)	A000362

Normal pump tubes should be replaced monthly, Viton pump tubes may need to be replaced weekly or as-needed to maintain system performance. Maximum life expectancy for normal pump tubes is approximately 800 hours.

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