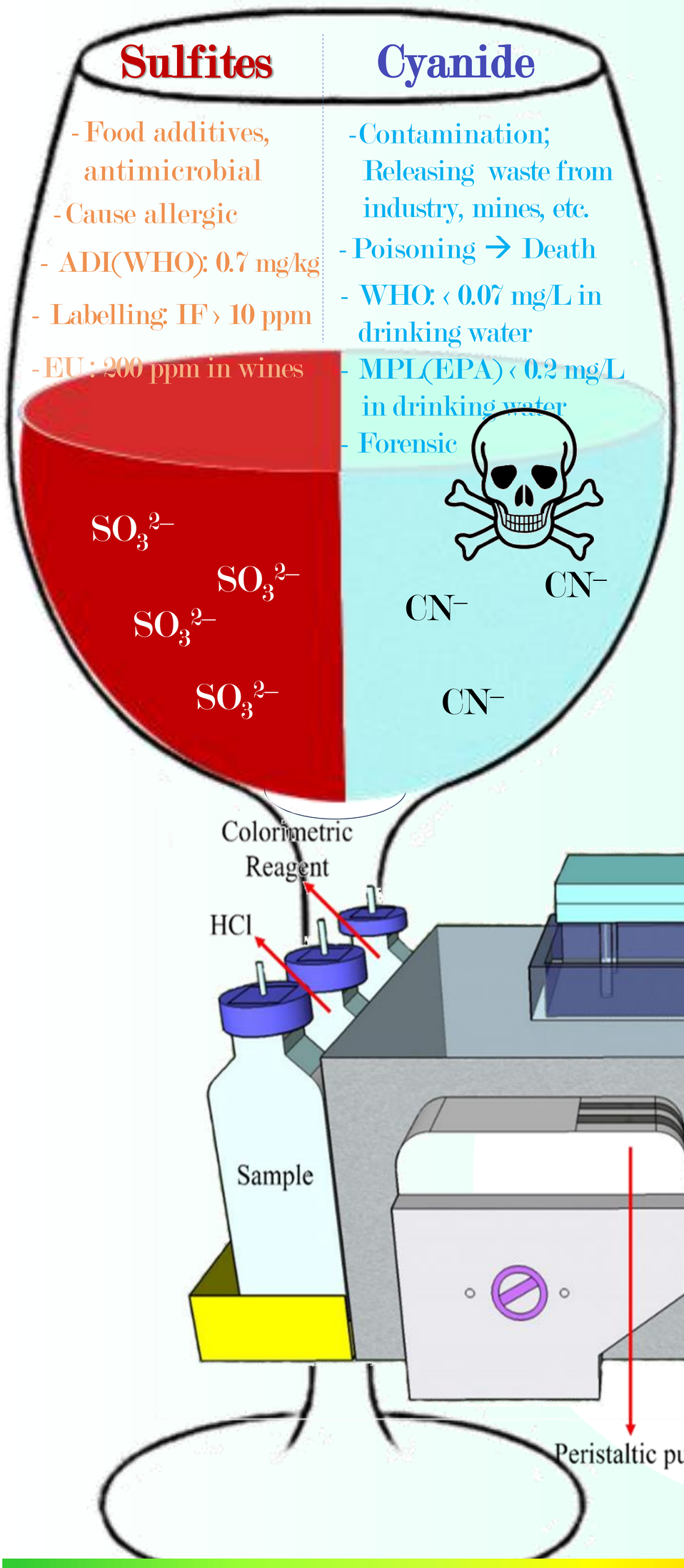
Automatic Cyanide and Sulfites Analyzer in Beverage

Sulfites	Cyanide
- Food additives, antimicrobial	-Contamination; Releasing waste from industry, mines, etc.
-Cause allergic	- Poisoning → Death
- ADI(WHO): 0.7 mg/kg	- WHO: ‹ 0.07 mg/L in drinking water
- Labelling: IF › 10 ppm	- MPL(EPA) ‹ 0.2 mg/L in drinking water
- EU : 200 ppm in wines	- Forensic



AIMs: for Food Safety/Forensic

To control amounts of sulphites in beverages such as wines, juices, etc.

To detect cyanide contamination in drinking water and other beverages.

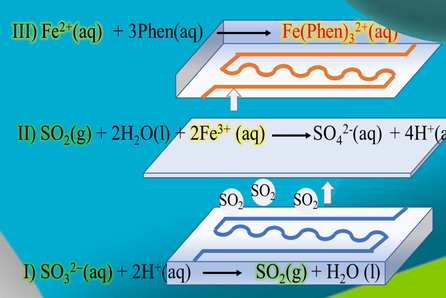
AUTOMATIC SYSTEM

"One Click Control"
- Reagent/Sample Volume
- Flow rate
- Detection system
- Data evaluation

μGDU

"Sample pretreatment"

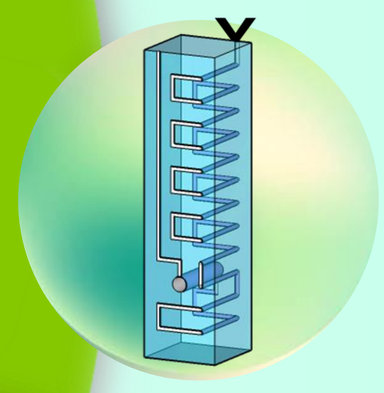
Eliminate interference in samples



"2 in 1 μFlow-cell"

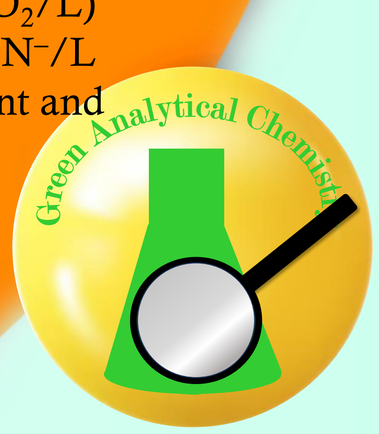
- Detection area
- Mixing Coil

Dimension
12.5x12.5x45 mm
Volume capacity 80 μL



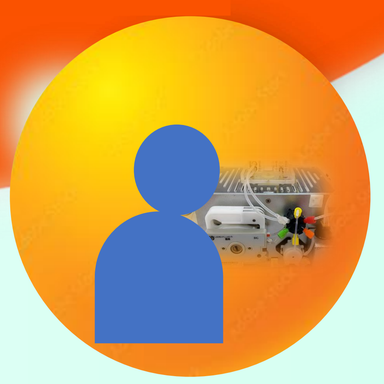
"Smart"

Automatically calculation
- Sulfites (mg SO_2/L)
- Cyanide (μg CN^-/L
- Reduce Reagent and waste



USER

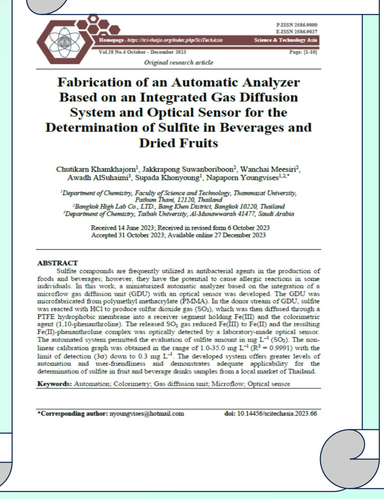
-FDA, Beverage Industry, Community Industry
-Forensic Police



Performance

Parameters	Cyanide	Sulfites
Standard Range	50-200 μg CN^-/L	1.0-35.0 mg SO_2/L
Non-linear calibration graph	Y=0.4894 ln X – 1.8821 R^2 0.9938	Y =-0.1354X^2+14.766X+21.755 R^2 0.9991
Accuracy	90.5-104.2 %	94.4-107.7 %
Precision	‹ 10 %RSD	‹ 5 % RSD
Limit of quantitation	50 μg CN^-/L	1.0 mg SO_2/L

Publication



Fabrication of an Automatic Analyzer Based on an Integrated Gas Diffusion System and Optical Sensor for the Determination of Sulfite in Beverages and Dried Fruits

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ABSTRACT

Sulfite compounds are frequently utilized as antibacterial agents in the production of foods and beverages; however, they have the potential to cause allergic reactions in some individuals. In this work, a miniaturized automatic analyzer based on the integration of a microflow gas diffusion unit (GDU) with an optical sensor was developed. The GDU was microfabricated from polymethyl methacrylate (PMMA). In the donor stream of GDU, sulfite was reacted with HCl to produce sulfur dioxide gas (SO_2), which was then diffused through a PTFE hydrophobic membrane into a receiver segment holding Fe(III) and the colorimetric agent (1,10-phenanthroline). The released SO_2 gas reduced Fe(III) to Fe(II) and the resulting Fe(II)-phenanthroline complex was optically detected by a laboratory-made optical sensor. The automated system permitted the evaluation of sulfite amount in mg L^{-1} (SO_2). The non-linear calibration graph was obtained in the range of 1.0-35.0 mg L^{-1} (R^2 = 0.9991) with the limit of detection (3σ) down to 0.3 mg L^{-1}. The developed system offers greater levels of automation and user-friendliness and demonstrates adequate applicability for the determination of sulfite in fruit and beverage drinks samples from a local market of Thailand.

Keywords: Automation; Colorimetry; Gas diffusion unit; Microflow; Optical sensor

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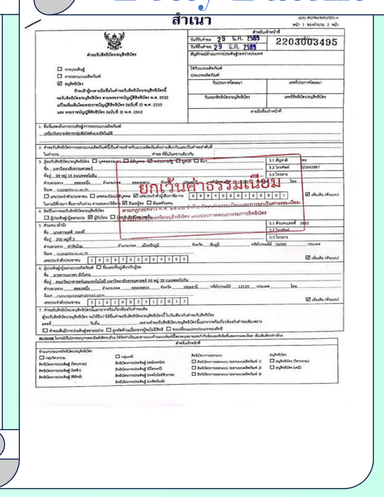
Petty Patent



สำเนา

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