

Measuring Elements in Residual Fuels and Crude Oil per Method ASTM D8322

Using an Agilent 4210 MP-AES

Using an Agilent 4210 MP-AES for ASTM D8322:

- provides extended elemental coverage compared to other single ASTM methods
- eliminates the need for multiple elemental techniques
- lowers the cost of ownership and significantly improves safety
- delivers results quickly
- requires little sample preparation
- is quick to setup and requires minimal operator experience

What is ASTM D8322?

ASTM D8322 is an accredited standard method for determining V, Ni, Ca, Na, Al, Si, Zn, and S in residual fuels and Fe, V, Ni, Ca, Na, K, and S in crude oils. The method uses microwave plasma atomic emission spectroscopy (MP-AES). The D8322 method complements and extends the capabilities of other test methods like D5708 and D5863, which only apply to the determination of Ni, V, and Fe in crude oils and residual fuels.

How does ASTM D8322 differ from similar methods?

Using MP-AES streamlines elemental analysis by allowing the use of a single technique. Measuring the same elements previously required using multiple ASTM methods and multiple techniques: Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES), Flame Atomic Absorption Spectrometry (Flame AAS), and X-ray spectrometry.

The method's simple organic "dilute and shoot" sample preparation also makes it simpler than other ASTM methods. For example, ASTM D5184 requires labor-intensive sample preparation such as sample ashing and fusion.

Table 1. A comparison of ASTM methods for elemental analysis of residual fuels and crude oil.

ASTM Method	D8322-20 (1)	D5708-15 (2)	D5863-00a (3)	D5184-12 (4)	D8252-19e1 (5)	D4294-16e1 (6)
Technique	MP-AES	ICP-OES	Flame AAS	Method A—ICP-OES Method B—Flame AAS	X-ray spectrometry	
Elements	Residual fuel oil: V, Ni, Ca, Na, Al, Si, Zn, & S Crude oils: Fe, V, Ni, Ca, Na, K, and S	Residual oils and crude oils: Ni, V, & Fe	Residual fuels and crude oil: Ni, V, Fe & Na	Fuel oils: (both methods): Al, Si	Residual oil and crude Oil: V & Ni	Petroleum & petroleum products: (total) S

Learn more about the ASTM D8322 method at the:
[Agilent Virtual Energy and Chemical Summit](#)



The 4210 MP-AES uses only nitrogen as a fuel, eliminating combustible gas usage and gas transportation. With minimal standby power consumption you can use less gas and electricity, compared to comparable techniques for crude and residual fuel analysis.

Why choose D8322 and Agilent MP-AES?

The Agilent MP-AES uses a nitrogen-based plasma, reducing the cost associated with the purchase of argon, for ICP-OES, and acetylene, for Flame-AAS. Unlike the other techniques, the MP-AES can be fitted with a nitrogen generator, eliminating the need for bottled gases. The nitrogen generator further reduces the cost and risks associated with the handling of gas bottles. The nitrogen generator also makes MP-AES ideal selection for remote locations. It is also preferred over Flame-AAS in petrochemical labs because it can be used without close supervision and does not use flammable gases.

With advanced, intuitive software, and plug-and-play hardware, methods can be set up quickly. With minimal training you will be an MP-AES Expert.

Application notes

Specific examples of metals analysis of petrochemicals using MP-AES include:

- Direct multi-elemental analysis of crude oils using the Agilent 4200/4210 Microwave Plasma-Atomic Emission Spectrometer, [Agilent publication number 5991-7104EN](#)
- Determination of metals in petroleum fractions using MP-AES, [Agilent publication number 5991-9122EN](#).
- Determination of major elements in methanol using the Agilent 4200 MP-AES with external gas control module, [Agilent publication number 5991-6469EN](#).
- Measurement of additives in lubricating oils using the Agilent 4100 MP-AES, [Agilent publication number 5990-8924EN](#)

For more information visit:

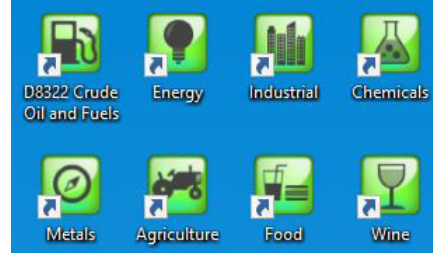
www.agilent.com/chem/4210mp-aes

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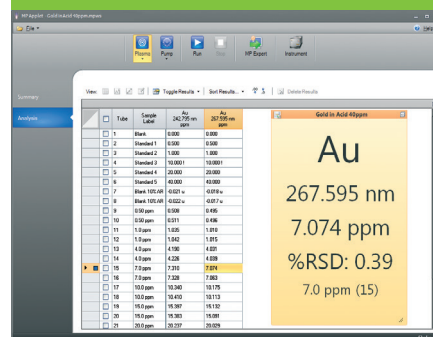
DE.8050115741
 © Agilent Technologies, Inc. 2020
 Published in the USA, October 2, 2020
 5994-1522EN

Three steps to analysis

1. Click the icon. The applet automatically loads the preset method



2. Enter sample labels, sample type, and weight/volume correction factors



3. Load samples and run the analysis

