

# Mercury (Hg) in Coal (SARM 20, SASOLBURG)

**Method ID: ASTM 6722**
**Category: Petrochemical**
**Technique: CAA**

## Summary

This technical note will describe the analysis of total mercury in coal (SARM 20), using the Teledyne Leeman Labs Hydra IIc mercury analyzer. This method utilized the moisture control system as described in AN1701 ([viewable here](#)) to enhance the performance of the Hydra IIc in standard, direct combustion mode for total mercury in this matrix.

Direct combustion mercury analysis, as described in ASTM 6722, is a simple method which eliminates lengthy sample preparations and the hazardous wastes generated from wet chemistry techniques. With no sample pretreatment, total mercury results are obtained faster and at less expense using the Teledyne Leeman Labs Hydra IIc mercury analyzer for direct combustion atomic absorption (CAA).

Weighed samples were introduced into the analyzer using an automated sequence. The unattended analysis of samples were completed at a rate of ~ 6 min / sample.

## Instrumentation

Hydra IIc CAA mercury analyzer, Envoy software version 2.2, quartz boats (calibration), nickel boats (samples), analytical balance, hot plate, watch glasses, disposable spatulas, pipettes/tips and labware/reagents for aqueous calibration standard preparation.

### Method Parameters

	°C	Seconds	Other
Oxygen Flow (mL/min)			350
Drying	300	30	
TempRamp*		60	
Decomposition	800	120	
Catalyst	600	20	
Amalgamator	700	30	
Integration		80	
LowPeakAbsLimit*			380000
NafionFurnaceTemp*			600
EluteWarmTempOverride*			175

\*Adjusted in, or added to, the startup.ini text file located in the Envoy folder.

## Calibration

Aqueous intermediate standards were prepared in 1% HNO<sub>3</sub> acid for mercury stability. Various weights of

intermediate calibration standards were added to quartz boats for total mass in ng of Hg, as listed below. Both Low and High Concentration ranges utilized a quadratic fit.

Low Concentration	Blank, 0.1, 0.5, 1, 5, 10, 20, 50 ng
High Concentration	Blank, 50, 100, 200, 400, 600, 800, 1000 ng

## Procedure

1. Homogenized sample in the container
2. Tare boats and add sample to boats
3. Load boats onto the sample boat shuttle
4. Run Hydra IIc using parameters listed with an automated sequence
5. Determine percent moisture in CRM for data analysis

## Sample Weight

Average sample weight range was > 0.1 g but less than 0.13 g.

## Results

	µg/g	
QAR-CRM-1 (0.121 µg/g)	0.123	102 % Recovery
SRM 1633c (1.005 µg/g)	0.917	91 % Recovery
SARM 20 (1)	0.256	
SARM 20 (2)	0.270	
SARM 20 (3)	0.266	
SARM 20 (4)	0.279	
SARM 20 (5)	0.252	
SARM 20 (6)	0.267	
SARM 20 (7)	0.270	
Avg	0.266 ± 0.007 @ 95 % Confidence	
STDEV	0.009	
MDL	0.022 @ 95 % Confidence	
Min	0.252	
Max	0.279	
QAR-CRM-1 (0.121 µg/g)	0.130	107 % Recovery
SRM 1633c (1.005 µg/g)	0.945	94 % Recovery

## Conclusion

The calibration curve check standard of 102% and 107% recovery for QAR-CRM-1, and 91% and 94% for NIST 1633c in demonstrate the system is in control and stable. The certified value for (SASOLBURG) SARM 20 is 0.250 µg/g with a range of (0.180 - 0.270) µg/g. This analysis of SARM 20 had a recovery of 0.266 ± 0.007 µg/g, which is 106.4% of the certified value. The Hydra IIc in standard mode is an ideal system for the determination of total mercury in coal, (SASOLBURG) SARM 20.