

Round Robin proficiency tests

Results within 3 % absolute error “is about the best that can be done for typical natural rock samples containing many phases”. (Calvert et al. 1989).

At X-ray Mineral Services we aim to quantify the majority of the minerals within 3 wt.% absolute error. As shown in the following examples we can now achieve much better results!

Periodic round robin organized by one of the major O&G companies

			BP Made	X-Ray Mins Result	X-Ray Mins Error	Difference from mixture
Bulk	Quartz	Mix 16-1	59.1	59.1	0.0	0.0
Bulk	Quartz	Mix 16-2	37.6	35.7	1.9	-1.9
Bulk	Quartz	Mix 16-3	21.7	24.1	2.4	2.4
Bulk	Quartz	Mix 16-4	11.2	12.3	1.1	1.1
Bulk	Albite	Mix 16-1	3.9	4.4	0.5	0.5
Bulk	Albite	Mix 16-2	5.9	6.9	1.0	1.0
Bulk	Albite	Mix 16-3	9.0	10.1	1.1	1.1
Bulk	Albite	Mix 16-4	9.5	11.3	1.8	1.8
Bulk	Siderite	Mix 16-1	3.1	2.8	0.3	-0.3
Bulk	Siderite	Mix 16-2	4.0	3.3	0.7	-0.7
Bulk	Siderite	Mix 16-3	1.2	1.6	0.4	0.4
Bulk	Siderite	Mix 16-4	0.0	0.5	0.5	0.5
Bulk	Calcite	Mix 16-1	9.7	10.7	1.0	1.0
Bulk	Calcite	Mix 16-2	12.2	12.7	0.5	0.5
Bulk	Calcite	Mix 16-3	12.3	13.4	1.1	1.1
Bulk	Calcite	Mix 16-4	20.8	19.6	1.2	-1.2
Bulk	Dolomite	Mix 16-1	7.4	10.0	2.6	2.6
Bulk	Dolomite	Mix 16-2	8.0	10.3	2.3	2.3
Bulk	Dolomite	Mix 16-3	18.5	20.6	2.1	2.1
Bulk	Dolomite	Mix 16-4	8.7	11.8	3.1	3.1
Bulk	Kaolinite	Mix 16-1	4.0	3.9	0.1	-0.1
Bulk	Kaolinite	Mix 16-2	6.6	5.1	1.5	-1.5
Bulk	Kaolinite	Mix 16-3	9.6	7.4	2.2	-2.2
Bulk	Kaolinite	Mix 16-4	11.3	11.5	0.2	0.2
						<2
						2-5
						>5
Average error						1.075
Standard Deviation						0.816

Periodic Round Robin on a set of 4 samples. This O&G company requires authorised vendors to obtain XRD results within 5% absolute error to the known compositions. Our results were within 1-2% with only one result at 3% difference.

Internal standard mixtures for carbonate samples only

These represent five synthetic mixtures which were mixed to meet the client's requirement, to check precision and accuracy for carbonate samples where a maximum of 1% absolute error can be achieved.

MIX 4	Dolomite	Calcite	Anhydrite	Quartz	Total %
Theoretical	15	75	10	0	100.0
Actual	15.2	74.5	10.0	0.3	100.0
MIX 4a	15.0	75.5	9.0	0.5	100.0
MIX 4b	15.1	75.4	9.0	0.5	100.0
MIX 4c	15.1	75.7	8.7	0.5	100.0
Mean	15.1	75.5	8.9	0.5	
StDev	0.1	0.2	0.2	0.0	
Abs Dev A	0.1	0.1	0.1	0.0	
Abs Dev B	0.1	0.1	0.1	0.0	
Abs Dev C	0.0	0.2	0.2	0.0	
Abs Mean-Actual	0.1	1.0	1.1	0.2	

MIX 1	Dolomite	Calcite	Anhydrite	Quartz	Total %
Theoretical	85	8	6	1	100.0
Actual	85.0	7.9	6.0	1.1	100.0
MIX 1a	85.3	8.1	5.2	1.5	100.0
MIX 1b	85.3	7.9	5.2	1.6	100.0
MIX 1c	85.0	8.0	5.4	1.6	100.0
Mean	85.2	8.0	5.3	1.6	
StDev	0.1	0.1	0.1	0.1	
Abs Dev A	0.1	0.1	0.1	0.1	
Abs Dev B	0.1	0.1	0.1	0.0	
Abs Dev C	0.2	0.0	0.2	0.0	
Abs Mean-Actual	0.2	0.1	0.7	0.5	

MIX 5	Dolomite	Calcite	Anhydrite	Quartz	Total %
Theoretical	84	13	1	2	100.0
Actual	83.2	12.7	1.0	3.1	100.0
MIX 5a	83.4	12.9	0.8	2.9	100.0
MIX 5b	83.2	13.0	0.7	3.1	100.0
MIX 5c	83.6	12.9	0.7	2.8	100.0
Mean	83.4	12.9	0.7	2.9	
StDev	0.2	0.0	0.1	0.2	
Abs Dev A	0.0	0.0	0.1	0.0	
Abs Dev B	0.2	0.0	0.1	0.2	
Abs Dev C	0.2	0.0	0.0	0.2	
Abs Mean-Actual	0.2	0.2	0.3	0.2	

MIX 2	Dolomite	Calcite	Anhydrite	Quartz	Total %
Theoretical	70	15	15	0	100.0
Actual	69.6	14.8	14.6	1.0	100.0
MIX 2a	70.1	15.1	13.6	1.2	100.0
MIX 2b	70.3	15.3	13.3	1.2	100.0
MIX 2c	69.8	15.5	13.6	1.1	100.0
Mean	70.0	15.3	13.5	1.2	
StDev	0.3	0.2	0.2	0.1	
Abs Dev A	0.0	0.2	0.1	0.0	
Abs Dev B	0.2	0.0	0.2	0.0	
Abs Dev C	0.3	0.2	0.1	0.1	
Abs Mean-Actual	0.4	0.5	1.1	0.2	

MIX 3	Dolomite	Calcite	Anhydrite	Quartz	Total %
Theoretical	90	3	6	1	100.0
Actual	90.5	3.0	6.0	0.5	100.0
MIX 3a	91.4	3.1	5.2	0.3	100.0
MIX 3b	91.3	2.9	5.5	0.3	100.0
MIX 3c	91.3	3.0	5.3	0.4	100.0
Mean	91.3	3.0	5.3	0.3	
StDev	0.1	0.1	0.2	0.0	
Abs Dev A	0.1	0.1	0.2	0.0	
Abs Dev B	0.1	0.1	0.2	0.0	
Abs Dev C	0.0	0.0	0.0	0.0	
Abs Mean-Actual	0.8	0.0	0.7	0.2	

