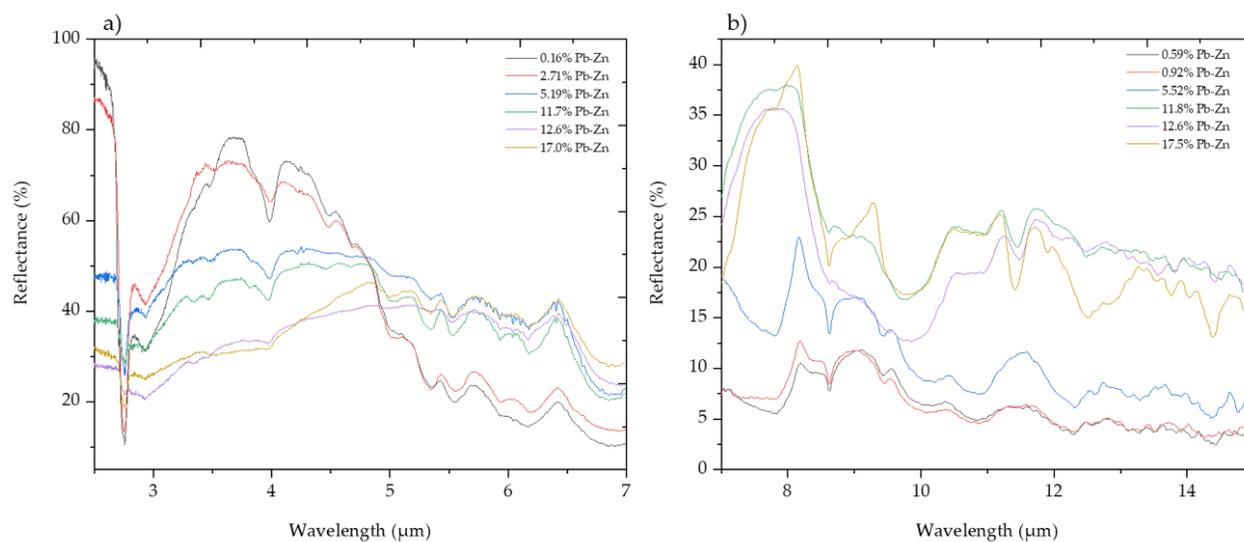**Figure S1:** PCA models of the LWIR data at (a) 3% cut-off and (b) 7% cut-off grades.

Figure S2: The spectra plots of some of the samples showing spectral variation based on the combined Pb–Zn concentration in the (**a**) MWIR; (**b**) LWIR regions. The plots show the spectral responses of the samples at different concentration values of the combined Pb–Zn.

Table S1: Confusion matrix of k-means model applied to MWIR dataset at the three cut-off grades.

3% cut-off

	Actual	Ore	Waste
Predicted		1	2
Ore	1	22	1
Waste	2	1	14
Correct classification rate			94.7%

5% cut-off

	Actual	Ore	Waste
Predicted		1	2
Ore	1	17	6
Waste	2	1	14
Correct classification rate			81.6%

7% cut-off

	Actual	Ore	Waste
Predicted		1	2
Ore	1	15	8
Waste	2	0	15
Correct classification rate			79%

Table S2: Confusion matrix of k-means model applied to SWIR dataset at the three cut-off grades.

3% cut-off

	Actual	Ore	Waste
Predicted		1	2
Ore	1	16	2
Waste	2	7	13
Correct classification rate			76%

5% cut-off

	Actual	Ore	Waste
Predicted		1	2
Ore	1	14	4
Waste	2	4	16
Correct classification rate			79%

7% cut-off

	Actual	Ore	Waste
Predicted		1	2
Ore	1	13	5
Waste	2	2	18
Correct classification rate			81.6%

Table S3: Confusion matrix of k-means model applied to LWIR dataset at the three cut-off grades.

3% cut-off		Actual	Ore	Waste
	Predicted		1	2
	Ore	1	20	0
	Waste	2	3	15
	Correct classification rate			92%

5% cut-off		Actual	Ore	Waste
	Predicted		1	2
	Ore	1	17	3
	Waste	2	1	17
	Correct classification rate			89.5%

7% cut-off		Actual	Ore	Waste
	Predicted		1	2
	Ore	1	15	5
	Waste	2	0	18
	Correct classification rate			87%

Table S4: Confusion matrix of k-means model applied to the fused SWIR and MWIR datasets at the three cut-off grades.

3% cut-off		Actual	Ore	Waste
	Predicted		1	2
	Ore	1	19	15
	Waste	2	4	0
	Correct classification rate			90%

5% cut-off		Actual	Ore	Waste
	Predicted		1	2
	Ore	1	17	2
	Waste	2	1	18
	Correct classification rate			92%

7% cut-off		Actual	Ore	Waste
	Predicted		1	2
	Ore	1	15	4
	Waste	2	0	19
	Correct classification rate			90%

Table S5: The calibration and validation models accuracy for the classification of the materials using SVC model and the fused VNIR and SWIR at 3%, 5% and 7% cut-off grades.

3% cut-off	Accuracy		Training	Validation
			1	2
	Accuracy (%)	1	92	81.6

3% cut-off	Accuracy		Training	Validation
			1	2
	Accuracy (%)	1	92	79

3% cut-off	Accuracy		Training	Validation
			1	2
	Accuracy (%)	1	97	84

Table S6: The calibration and validation models accuracy for the classification of the materials using SVC model and the fused SWIR and MWIR at 3%, 5% and 7% cut-off grades.

3% cut-off	Accuracy		Training	Validation
			1	2
	Accuracy (%)	1	100	95

3% cut-off	Accuracy		Training	Validation
			1	2
	Accuracy (%)	1	100	90

3% cut-off	Accuracy		Training	Validation
			1	2
	Accuracy (%)	1	97	87

Table S7: The calibration and validation models accuracy for the classification of the materials using SVC model and the fused MWIR and LWIR at 3%, 5% and 7% cut-off grades.

3% cut-off	Accuracy		Training	Validation
			1	2
	Accuracy (%)	1	100	92

3% cut-off	Accuracy		Training	Validation
			1	2
	Accuracy (%)	1	100	90

3% cut-off	Accuracy		Training	Validation
			1	2
	Accuracy (%)	1	100	84