Application Note EDXRF1994

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EDXRF1994 - Material Identification

Scope

Demonstrate Material Identification for standard ASTM and JIS alloy tables and user-definable custom identification tables.

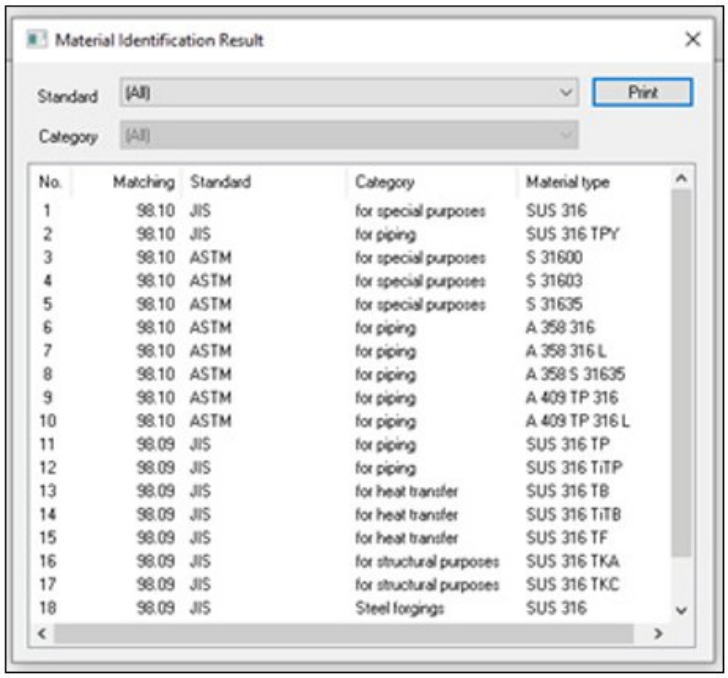
Background

Material identification, also called positive material identification or PMI, is used to analyze and identify materials for quality assurance and quality control to verify proper alloy or material is being used. Material identification can also be used to quickly sort unknown alloys and other materials, including powders and liquids, and can be used in industrial forensics and failure material analysis identification. By looking at the structure of the elemental constituents in a sample, material identification verifies material type by comparing differences in composition that define the specific types of materials being analyzed.

XRF offers a non-destructive means for material identification. Applied Rigaku Technologies EDXRF systems offer the standard alloy identification tables as well as the capability for the user to create a custom table defined for any material where the types of materials can be differentiated by differences in element composition.

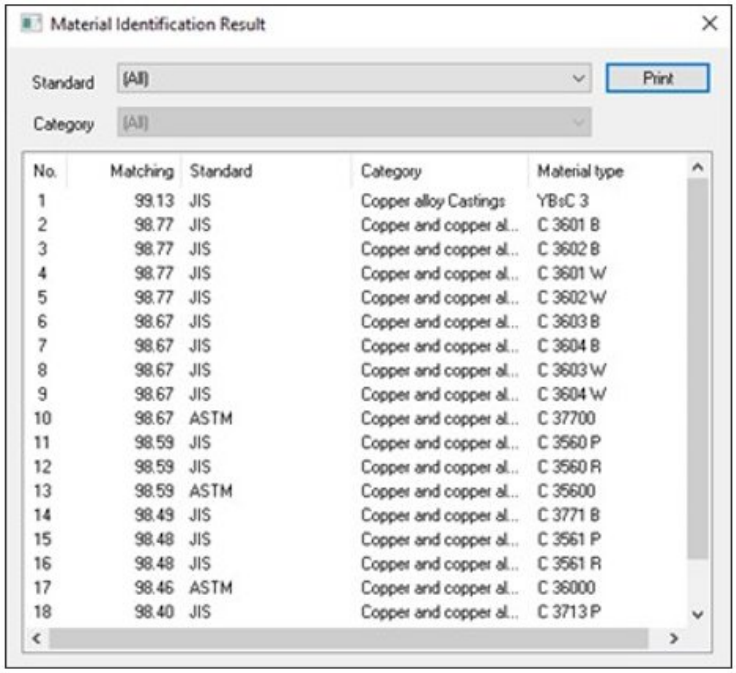
Standard alloy identification tables

The ASTM and JIS standard alloy tables for ferrous, aluminum, and copper alloys are included.



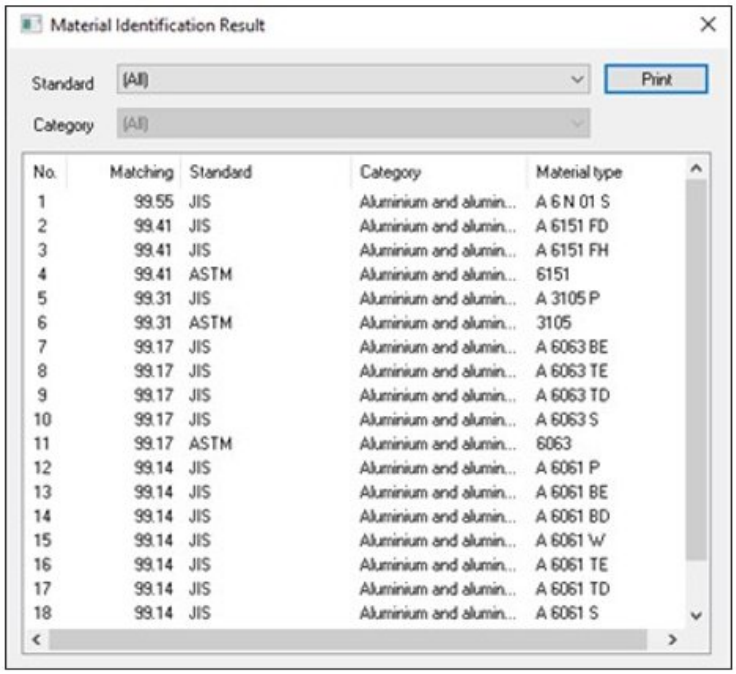
No.	Matching	Standard	Category	Material type
1	98.10	JIS	for special purposes	SUS 316
2	98.10	JIS	for piping	SUS 316 TPY
3	98.10	ASTM	for special purposes	S 31600
4	98.10	ASTM	for special purposes	S 31603
5	98.10	ASTM	for special purposes	S 31635
6	98.10	ASTM	for piping	A 358 316
7	98.10	ASTM	for piping	A 358 316 L
8	98.10	ASTM	for piping	A 358 S 31635
9	98.10	ASTM	for piping	A 409 TP 316
10	98.10	ASTM	for piping	A 409 TP 316 L
11	98.09	JIS	for piping	SUS 316 TP
12	98.09	JIS	for piping	SUS 316 TiTP
13	98.09	JIS	for heat transfer	SUS 316 TB
14	98.09	JIS	for heat transfer	SUS 316 TiTB
15	98.09	JIS	for heat transfer	SUS 316 TF
16	98.09	JIS	for structural purposes	SUS 316 TKA
17	98.09	JIS	for structural purposes	SUS 316 TKC
18	98.09	JIS	Steel forgings	SUS 316

In this example, an unknown piece of stainless steel is measured using semi-quant FP and identified as SS316.



No.	Matching	Standard	Category	Material type
1	99.13	JIS	Copper alloy Castings	YBsC 3
2	98.77	JIS	Copper and copper al...	C 3601 B
3	98.77	JIS	Copper and copper al...	C 3602 B
4	98.77	JIS	Copper and copper al...	C 3601 W
5	98.77	JIS	Copper and copper al...	C 3602 W
6	98.67	JIS	Copper and copper al...	C 3603 B
7	98.67	JIS	Copper and copper al...	C 3604 B
8	98.67	JIS	Copper and copper al...	C 3603 W
9	98.67	JIS	Copper and copper al...	C 3604 W
10	98.67	ASTM	Copper and copper al...	C 37700
11	98.59	JIS	Copper and copper al...	C 3560 P
12	98.59	JIS	Copper and copper al...	C 3560 R
13	98.59	ASTM	Copper and copper al...	C 35600
14	98.49	JIS	Copper and copper al...	C 3771 B
15	98.48	JIS	Copper and copper al...	C 3561 P
16	98.48	JIS	Copper and copper al...	C 3561 R
17	98.46	ASTM	Copper and copper al...	C 36000
18	98.40	JIS	Copper and copper al...	C 3713 P

Identification of unknown brass sample



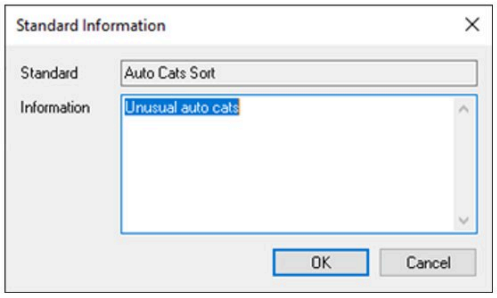
Identification of unknown aluminum sample

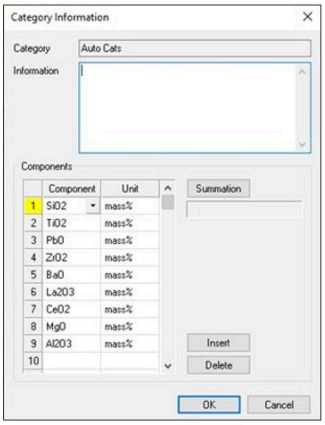
Custom identification table

Rigaku Material Identification software allows the user to create and define a custom identification table for any material where the types of the material are differentiated by elemental composition.

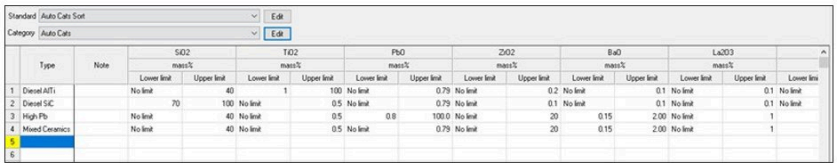
In this example, an identification for sorting unusual auto cats is demonstrated. The material types and criteria for differentiating are determined by the user to best fit the specific needs at the facility.

Create a new standard table, define the category, and list the major elements in the material that are used to differentiate the various material types.





Next, list the types of material and enter the elemental limits that define the differences between each type.



	Type	Note	SiO2 mass%		TiO2 mass%		PbO mass%		ZrO2 mass%		BaO mass%		La2O3 mass%	
			Lower limit	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit
1	Diesel AlTi		No limit	40	1	100	No limit	0.79	No limit	0.2	No limit	0.1	No limit	0.1
2	Diesel SiC		70	100	No limit	0.5	No limit	0.79	No limit	0.1	No limit	0.1	No limit	0.1
3	High Pb		No limit	40	No limit	0.5	0.8	100.0	No limit	20	0.15	2.00	No limit	1
4	Mixed Ceramics		No limit	40	No limit	0.5	No limit	0.79	No limit	20	0.15	2.00	No limit	1
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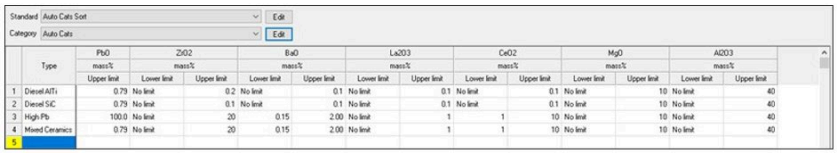
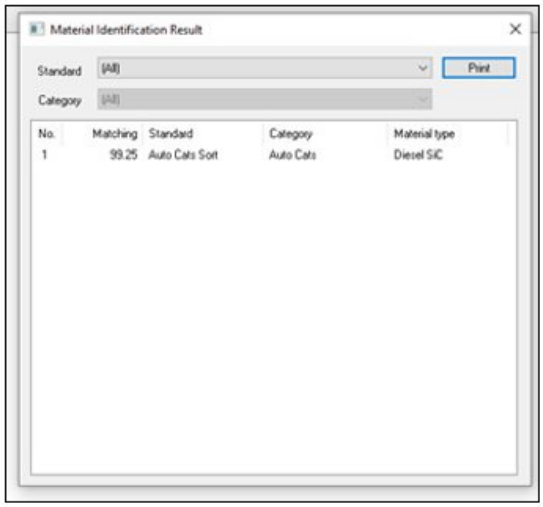
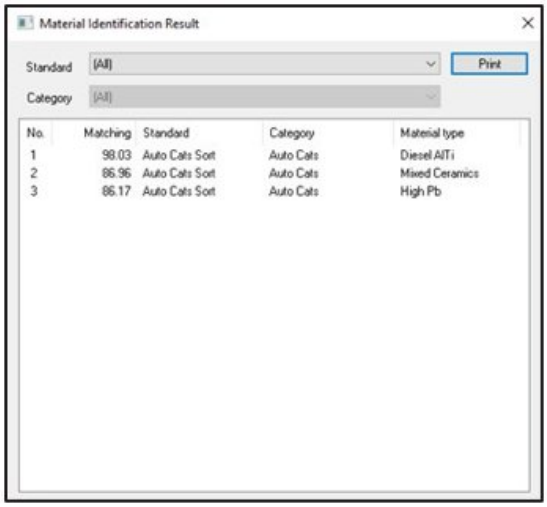


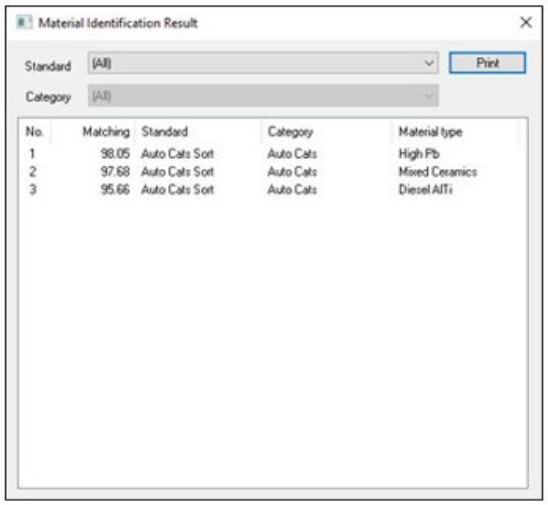
	Type	PbO mass%		ZrO2 mass%		BaO mass%		La2O3 mass%		CeO2 mass%		MgO mass%		Al2O3 mass%	
		Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit	Upper limit
1	Diesel AlTi	0.79	No limit	0.2	No limit	0.1	No limit	0.1	No limit	0.1	No limit	10	No limit	40		
2	Diesel SiC	0.79	No limit	0.1	No limit	0.1	No limit	0.1	No limit	0.1	No limit	10	No limit	40		
3	High Pb	100.0	No limit	20	0.15	2.00	No limit	1	1	10	No limit	10	No limit	40		
4	Mixed Ceramics	0.79	No limit	20	0.15	2.00	No limit	1	1	10	No limit	10	No limit	40		
5																



Example of identification of SiC diesel auto cat sample



Identification of an aluminum titanate diesel cat.



Identification of an auto cat with unusually high lead

Conclusion

Rigaku Material Identification software gives the user a tool for alloy PMI and the ability to create custom identification tables for material verification and sorting applications.

Related products

NEX CG II Series

High-performance *indirect excitation* EDXRF for complex ap plications with trace elements and variable base matrices

NEX DE Series

High-power 60 kV EDXRF systems delivering speed, precisi on, and small spot measurements

NEX QC Series

Combines quality, affordability, and performance for a wide range of applications