

**※ Attachment 1. Analysis standard for Heavy Metals and PBBs, PBDEs
(use as reference)**

1. Standard for Heavy Metal Analysis (use as reference)

The analysis method of lead, mercury, cadmium, hexavalent chromium, PBBs, and PBDEs is based on the content measurement method presented in KS C IEC 62321 [Standard name: Quantification of specific substances in electrical and electronic products], and the detailed analysis standards for each material refer to the specification table below. However, for Chinese sales specifications, the content measurement method of QC/T941~4 shall be followed.

Table 1. Standard for Heavy Metal Analysis

Classification		Pb	Cr ⁶⁺	Hg	Cd
Metal					
Ferrous metal					
Steel	Steel, Iron	ASTM E 350 KS D 1822	ASTM E 350	-	-
	Alloy	ASTM E 352 KS D 1813	ASTM E 352	-	-
Cast Iron	ASTM E 351	ASTM E 351	-	-	ASTM E 351
Nonferrous metal					
Copper and Copper Alloy		ISO 4749 ASTM E 478 KS D 1895	-	KS D 1919 JIS H 1066	ISO 5960 ASTM E 478 KS D 1688
Aluminum and Aluminum Alloy		ISO 4192 KS D 1882 KS D ISO 4192	-	-	KS D 1689
Nickel and Nickel Alloy		ISO 11437 ISO 6351 ISO 7523 KS D ISO 6351 KS D ISO 7523	-	-	ISO 6351 ISO 7523 KS D ISO 6351 KS D ISO 7523
Zinc and Zinc Alloy		ASTM E 536 ASTM E 1277 EN 12441-3 KS D 1758 KS D 1930	-	-	ASTM E 536 ASTM E 1277 EN 12441-3 KS D 1758 KS D 1930
Magnesium and Magnesium Alloy		BS 3907-15 KS D ISO 11707	-	-	KS D ISO11707
Classification		Pb	Cr ⁶⁺	Hg	Cd

Non metal				
Textiles	BS 6810-1,2 KS K 0852	-	BS 6810-1,2 KS K 0852	BS EN 1122 BS 6810-1,2 KS K 0852
Leather	ISO 6101-2	KS M ISO 17075-1,2	-	BS EN 1122
Rubber	ISO 6101-2 KS M 6584 ASTM D 4004 KS R 1301	-	-	ISO 6101-2 BS EN 1122 KS R 1301
Plastic	KS C IEC 62321-5	-	-	BS EN 1122 KS C IEC 62321-5
Paint	ISO 6503 ASTM D 3335 KS M 5985 KS M 5986 KS M ISO 6503	-	ISO 7252 ASTM D 3624	ASTM D 3335 KS M 5985
Glass	KS L 2018	KS L 2019	KS L 2100	KS L 2018
Paper	KS M 1073	-	EN 12497	ISO 10775 KS M 7703
Adhesives Agents	KS C IEC 62321-5	-	KS C IEC 62321-4	KS C IEC 62321-5
Materials for Fraction	KS R 1300	-	-	
Piezoelectric Transmitter (PZT)	KS D 1661	-	-	-
Glass in Bulb	-	-	KS L 2100	-
Wood	KS M ISO 16968	-	KS M ISO 16968	KS M ISO 16968
Fuel	ISO 3830 ASTM D 3237 KS M 2402	-	-	
Lubricant	ASTM D 5185 KS M 2402	-	-	ASTM D 5185
Resistors	KS M 1810	-	-	KS M 1810
Others				
Soldering	KS D 1980	-	-	KS D 1980
Chromate Surface Treatment	-	ISO 3613 ASTM D 6492 KS D 1662	-	-

✓ The analysis standards listed above can be used as the reference analysis methods. Other analysis

standards not listed above can also be used as long as the analysis method is officially approved.

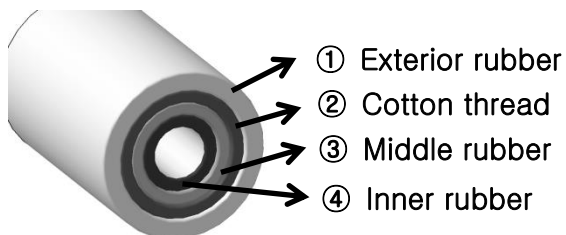
- ✓ For materials not listed in the cases, the type of analysis should be based on an agreement with analytical specialists who perform analysis with equivalent materials.
- ✓ In cases where the analysis method has not been decided, any questions should be directed to a person in charge of analysis in the correspondent team (Material Analysis Team, Hyundai Quality Assurance Team 3, Kia Quality Assurance Management Team)

2. Example of Analysis (use as reference)

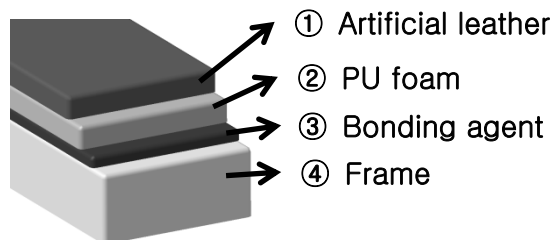
2.1 Multi layered materials

- Separate into individual layer and analyze homogeneous material(①,②,③,④...)
- If it is difficult to separate individual layer from parts, analyze raw material of each layer.

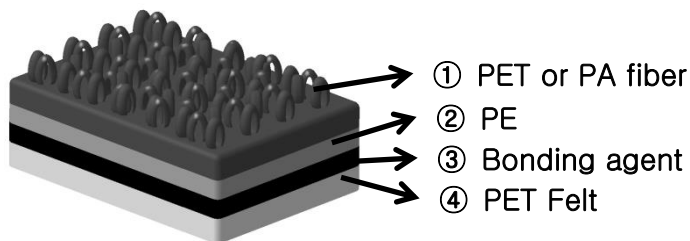
ex 1) Rubber hose for fuel system



ex 2) Interior trim



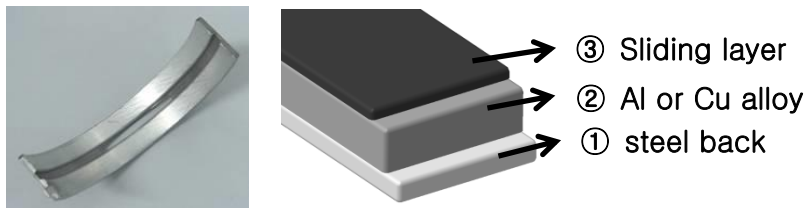
ex 3) Floor carpet



2.2 Multi-layer metal

- Analyze each metal layer separately.
- : For it is impossible to separate each layer from part, analysis raw material of each layer.

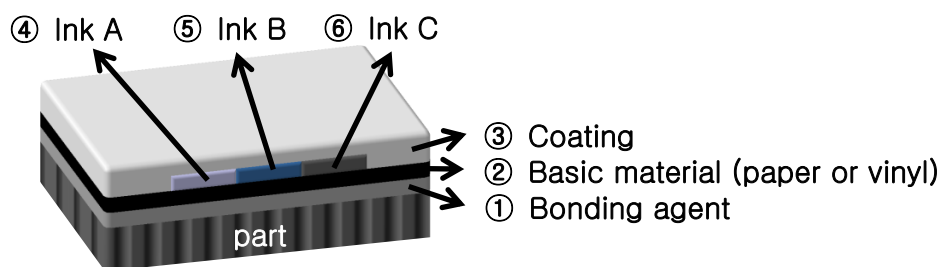
ex) Bearing shell & bush



2.3 Printings, labels

- Separate individual materials(①,②,③,④...) and analyze each material.
- If it is difficult to separate individual layer from parts, analyze a raw material of each layer.

ex) Warning label

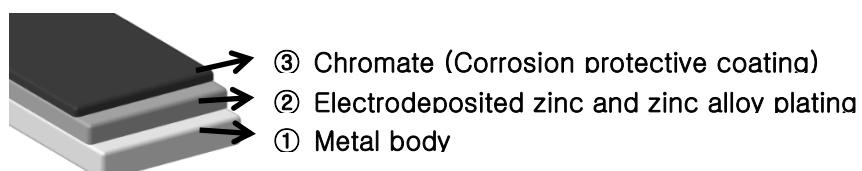


2.4 Corrosion protective coating

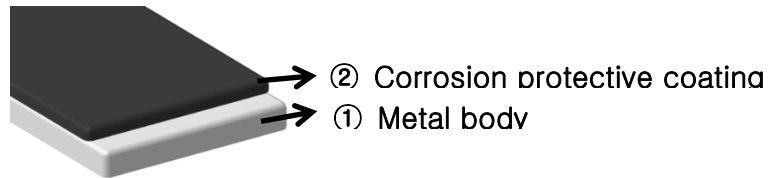
$$\text{content (wt\%)} = \frac{\text{Weight of hexavalent chromium}}{\text{Weight of corrosion protective coating}} \times 100$$

- If it is impossible to separate and measure weight of corrosion protective coating, analyze a raw corrosion protective coating solution. (In the case of plating solution, the analysis must be performed at the same condition as coated on part, i.e. the sample for the analysis is prepared by drying to remove solvent.)

ex) Hardware



<Electrodeposited zinc and zinc alloy plating – Chromate>



<Chromates-zinc organic type>

※ Refer to KS C IEC 62321-7-1 and KS D ISO 3613 for measuring hexavalent chromium content of colored chromate film