JAMP AIS

Material Classification Manual(Ver.2.01)

June. 12, 2012

(Summary)

For the purpose of making a declaration on a homogeneous-material basis when AIS discloses information on chemicals contained in products, this Material Classification is mainly aimed at:

・distinguishing each component of an article as a material, and

・Providing useful information contributing to recycle design and other environmentally conscious designs.

This Material Classification describes and provides information on “material.”

Consequently, it enables the estimation of recyclability rates, as defined by ISO22628 in the automobile industry, and recycling rates for household electric appliances, and it promotes environmentally friendly products leading to end products.

Meanwhile, it is not primarily aimed at providing material information mainly intended for LCA. The reason is that basic units are currently subdivided into various categories and supplied to LCA from different sectors without adequate standardization. Thus, it is considered difficult to provide standardized material information which would conform to all categories.

However, no AIS recipients are prevented from using this information for LCA purposes based on the material classification proposed here.

As stated above, materials are described based on individual components with certain functions, which are included in parts of articles. Therefore, even if some stakeholders fail to obtain necessary information on contained materials, AIS recipients can identify a certain number of spin-off effects for similar items, thereby minimizing business risk.

Moreover, it describes materials with regard to every element of an article and it can be said to be “full disclosure.” However, except for the information on the declarable substances, the information contained here is not required to be expanded to include chemicals which are classified by CAS number.

This Material Classification is partly based on how plastics are being utilized and how materials are being recycled in the household electric appliance industry. It also considers the correspondence with the subdivision of VDA materials, so that it can be made available for information entry in the existing information survey system that deals with contained chemicals in the electrical and electronics industries and the automobile industry.

Accordingly, it provides prospective material information to the extent that recyclers require (even though not all the material information is necessarily reflected in recycling processes because the current technology only allows description regardless of part weight).

In addition, material items are NOT added, removed nor modified in the revision from ver.1.03 to ver.2.00. From the AIS input supporting tool ver.4.00, the materials are"grouped" by its material use and the relevant materials will be shown on the material list selection screen (JAMP-AIS030-2012-1-LIST.pdf) when you chose the matrtial use.

Fix the errors in an English translation of rhodium plating (S011)

■AIS Material List (ver. 2.01)

Input method of material

In case of "components" except surface treatment (ex. base material, clad, attached agent, inner preparations), select one from the table of "(1) Normal case".
In case of surface treatment, select one from the table of "(2) Case of surface treatment".

(1) Normal case (except surface treatment)

Use (of Material)	base material
	clad
	attached agent
	solder joint
	inner preparations (ex. applied on preparations used for operation)

corresponding system			Classification except surface treatments	Material Classification Number
Material Classification	Inorganic materials	Steel and iron materials	Highly alloyed steel	R111
			Highly alloyed cast iron	R112
			Steel and iron materials (Large clasification)	
			Steels/cast steel/sintered steel (Middle classification)	R101
			Unalloyed, low alloyed steel	R102
			Cast iron (Middle classification)	R103
			Cast iron with lamellar graphite / tempered cast iron	R104
			Cast iron with nodular graphite / vermicular cast iron	R105
		nonferrous metals	Cast aluminium alloys	R211
			Wrought aluminium alloys	R212
			Cast magnesium alloys	R221
			Wrought magnesium alloys	R222
			Copper (e.g. copper amounts in cable harnesses)	R311
			Copper alloys	R312
			Zinc and Zinc alloys	R330
			Nickel and Nickel alloys	R340
			Lead and Lead alloys	R350
			Sn-Pb solder	R351
			Lead-free solder	R361
			Gold	V421
			Platinum / rhodium	V411
			Other special metals	V412
			Titanium and titanium alloys	P398
			Other nonferrous metals	P399
		non-metal inorganic materials	Ceramics	N720
			Glass	N721
			Other inorganic materials	N498
	Organic materials	Thermoplastics	Filled Thermoplastics	N499
			PE (Polyethylene)	P511
			PP (Polypropylene)	P512
			PS (Polystyrene)	P513
			PVC (Poly(vinyl chloride))	P514
			PC (Polycarbonate)	P515
			POM (Polyacetal)	P516
			A(B)S Poly(acrylonitrile (-butadiene)-styrene)	P517
			PA (Polyamide)	P518
			PET (Poly(ethylene terephthalate))	P519
			PPE ((Modified) polyphenylene ether)	P520
			Thermoplastic elastomer	P528
			Other thermoplastics	P529
		Cured resin, etc	PUR (Polyurethane)	N541
			UP (Unsaturated polyester)	N542
			EP (Epoxy resin)	N551
			Others (Cured resin or duromers)	N543
			Others (Rubber/non-thermoplastic Elastomer)	N544
			Polymeric compounds	N545
			Plastics (in polymeric compounds)	N546
			Textiles (in polymeric compounds)	N547
		Modified organic natural materials	Wood	N711
			Paper	N712
			Fiber	N713
			Leather	N714
		Operational Preparation	Refrigerant	N950
			Lubricants,Brake fluid, etc	N900
			Others (Powder,etc)	N999

R:Recycable, V:Valuable, P:Possible to recycle, N:Not possible to recycle

(2) Case of surface treatment

(surface treatment)	
Use (of Material)	plating
	thermal spraying
	chemical conversion treatment
	PVD(Physical Vapor Deposition)
	CVD(Chemical Vapor Deposition)
	painting
	marking

Use of Material	Calssification for surface treatments	Material Classification Number
Plating	Zinc plating	S001
	Nickel plating	S002
	Aluminum plating	S003
	Copper plating	S004
	Tin plating	S005
	Chromium plating	S006
	Cobalt plating	S007
	Gold plating	S008
	Platinum plating	S009
	Paradium plating	S010
	Rhodium plating	S011
	Silver plating	S012
	Cadmium plating	S013
Thermal spray	Zinc spray coating	S101
	Aluminum spray coating	S102
	Build-up thermal spraying	S103
	Thermal spraying of self-fluxing alloy SFCo	S104
	Thermal spraying of self-fluxing alloy SFWC	S105
	Ceramic sprayed Coatings P-AO	S106
	Ceramic sprayed Coatings P-CrO	S107
	Ceramic sprayed Coatings P-AO-MgO	S108
	Ceramic sprayed Coatings P-ZrO	S109
	Cermet thermal spraying C-WC-Co	S110
	Cermet thermal spraying C-CrC-Ni-Cr	S111
Chemical conversion treatment	Hexavalent chromate film	S201
	Trivalent Chromium Passivation	S202
	Chromium-free Passivation	S203
	GEOMET Coating	S204
	BONDE Coating (Oxalic)	S205
	ZAY Coating	S206
	Anodic Oxidation Coatings	S207
	Combined coatings of anodic oxide and organic coatings	S208
	Corrosion protection of magnesium alloys	S209
	Corrosion protection of aluminium alloys	S210
	Black Oxide Coatings	S211
	Phosphate Coatings	S212
PVD, CVD	CrN Coatings	S301
	DLC Coatings	S302
	TiN Coatings	S303
	Gold vapor deposition film(Icd.Sputtering)	S304
	Vapor deposition film(Icd.Sputtering) of other noble or rare metals	S305
	Other film coating of inorganic compounds	S306
Painting, Marking	Painted resin	S401
	Non electrolytically applied zinc flake coatings (Dacrotizing)	S402
	Coating (ceramics)	S403
	Coating (glass)	S404
	Coating (Other compounds)	S405

Description of Material Classification

Material

This is a classification of materials as components of an article, made available as information that can be utilized in recycle design and other environmentally conscious designs (for instance, calculation of recyclability rates (ISO22628) and recycling rates). It is not a detailed classification of chemicals.

Highly alloyed steel

An alloy steel means modified steel or steel to which more than one alloy element is added in order to obtain characteristics for specific purposes. Specifically, a high-alloy steel means an alloy steel which contains alloy elements over 10 weight percent(wt%) in total. So-called stainless steel is a high-alloy steel with iron as the main constituent to which approximately 10.5(wt)% (JIS G0203 simply defined based on %) or more of chrome is added.
ISO uses mass percent (mass%), which is essentially the same as weight percent (wt%). Since AIS and other data formats in other industries use wt%, wt% is used for expressing percentages.
(Reference: ISO4948-4:1982 and 4948-2:1981)

Highly alloyed cast iron

This category includes iron alloys which contain nickel (Ni), chrome (Cr), molybdenum (Mo) and other composition metals over 10 wt% in total and also contain carbon in the proportion of 2.14 wt% to 6.67wt%. Having a low melting point, they are used for the casting of molten metal into a mold.

Unalloyed steel and low alloyed steel

Unalloyed steel that does not follow the alloyed steel definition. Low alloyed steel that consists of alloy elements below 10 weight percent(wt%) in total. Refer to the above and ISO4948-1 and 4948-2.

Cast iron with lamellar graphite / tempered cast iron

Flake graphite cast iron is the cast iron deposited in the form of aggregated flower petals (flake graphite) when carbon is solidified into free graphite. It is also called gray cast iron. It has good vibration absorption capacity and damping capacity. Since graphite acts as a lubricant and has good heat conductivity, it can easily release frictional heat and its elastic modulus is not very high. Thus, it is a highly wear-resistant material. These characteristics allow it to be used as bearing, gear, brake shoe and other wear-resistant parts.
The castability of malleable cast iron is as good as gray cast iron and as tough as steel. Malleable cast iron is not made by forging. “Malleable” means capable of being bent without breaking easily.

Cast iron with nodular graphite / vermicular cast iron

Cast iron made by crystallizing graphite into fine balls is called cast iron with nodular graphite. The more spherical each particle of graphite is, the better mechanical properties (tensile strength, stretch) the cast iron has. Being as strong and tough as steel, it is used for cast iron pipes and automobile engines.

*Note regarding iron and steel and iron-containing materials

The above-mentioned iron and steel and iron-containing materials are iron and alloys with iron as the main constituent. Ferrite is a ceramic containing iron oxide, and it is not included in the above categories.

Cast aluminum alloys

This category includes gravity-cast or die-cast aluminum and alloys with aluminum as the main constituent. Because pure aluminum is a soft metal, it is alloyed with copper, manganese, silicon, magnesium, zinc, nickel, etc.

Wrought aluminum alloys

This category includes forged aluminum and alloys with aluminum as the main constituent. The forging procedure consists of applying pressure to metal by hammering it, compressing voids in the metal, refining the crystals, and aligning them in the same direction, thereby increasing the metal’s strength. Because pure aluminum is a soft metal, it is alloyed with copper, manganese, silicon, magnesium, zinc, nickel, etc.

Cast magnesium alloys

This category includes gravity-cast or die-cast magnesium and alloys with magnesium as the main constituent. Aluminum and zinc are used as additional elements.

Wrought magnesium alloys

This category includes forged magnesium and alloys with magnesium as the main constituent. The forging procedure consists of applying pressure to metal by hammering it, compressing voids in the metal, refining the crystals, and aligning them in the same direction, thereby increasing the metal’s strength. Aluminum and zinc are used as additional elements.

Copper (e.g. copper in cable harnesses)

Since it has the highest electrical conductivity after silver and it is relatively inexpensive, copper is often used as electric wires and cables. Only the conductive function needs to be taken into account.

Copper alloys (including brass)

This category includes alloys with copper as the main constituent, namely, cupronickel or an alloy of copper and nickel, an alloy of aluminum and copper, brass or an alloy of copper and zinc, and bronze or an alloy of copper and tin. Cadmium copper alloy, chrome copper alloy, teryllium copper alloy, beryllium copper alloy and other high-purity copper alloys containing traces of additional elements are also used for industrial purposes.

Zinc and zinc alloys

This category includes zinc and alloys with zinc as the main constituent. Since brass for practical purpose contains zinc in a proportion of less than 45%, brass shall be regarded as a copper alloy.

Nickel and nickel alloys

This category includes nickel and alloys with nickel as the main constituent. Since nickel coins are made of cupronickel containing copper (75%) and nickel (25%), they shall be regarded as a copper alloy.

Lead and lead alloys

This category includes lead and alloys with lead as the main constituent.

Sn-Pb solder

This category includes solders of lead-tin alloys, used in large quantities for mounting electronic components on electronic print circuit boards. Specifically, they are high-melting-point solders or those with a lead content of over 1000ppm.

Lead-free solders

This category includes solders which do not contain lead at a level such that is not regarded as an impurity. JIS Z 3282 (Soft solders--Chemical compositions and forms) sets the maximum lead content at 0.10wt% (1000ppm). Substantially, this category includes alloys with tin as the main constituent.

Special metals (gold)

This category includes gold and alloys with gold in a proportion of 75% or more.

Special metals (platinum and rhodium)

This category includes platinum and rhodium. They are used as catalysts in automobile-related parts. In the case that a specialty metal is applied in the form of a carrier supporting a small amount of the metal, the material of the carrier should be taken into account for the classification. In the case that the carrier is activated carbon or alumina, it should be classified as a ceramic.
(If small amounts of platinum and palladium are described as voluntary declarable substances, recipients may be glad.)

Other special metals (silver, palladium, etc.)

This category includes silver, palladium, and other precious metals and rare metals. At present, they are used in materials with silver and palladium as the main constituents. They are sometimes used in silver paste and electronic components.

Titanium and titanium alloys

Titanium and titanium alloys with aluminum, copper, iron, manganese, molybdenum, etc. are characterized by strength, lightness, extraordinary corrosion resistance, and high-temperature resistance. Taking advantage of these properties, they are used for various purposes, such as in aircraft including fighter aircraft and passenger planes, automobiles, pressure hulls of submarines, rockets, missiles, spoons, forks, Chinese woks, seals, spectacle bows, watchbands, frying pans, golf clubs, bicycle frames, etc. They are also used as a deoxidizing agent for alloys of iron and steel and used for the purpose of reducing the carbon content in stainless steel. They have some drawbacks in terms of workability.

Other nonferrous metals

Although the term generally means metal materials other than iron and steel materials (i.e., iron and alloys with iron as the main constituent), some of them are included in other categories in this classification. Thus, this category shall include nonferrous metals other than aluminum, copper, nickel, lead, and precious metals (as classified above). Silicon and GaAs fall into this category because they can be regarded as metalloid or metalloid alloy.

Ceramics

The term is narrowly defined as a substance, with metal oxide as the basic constituent, sintered by heat treatment at high temperatures. Based on the production method, glass could be regarded as a ceramic. Therefore, this category shall include those containing crystalline elements.

Glass

The term means an amorphous solid which exhibits glass transition phenomenon at elevated temperatures. It also means a substance which becomes such a solid. This solid state is called a glass state. It possesses rigidity as high as that of crystals and also possesses extremely high viscosity. An amorphous material which is soft like rubber is not called a glass. This category excludes organic glasses such as amorphous polymeric materials and includes inorganic glasses.

Other inorganic compounds

This category includes substances, such as oxides, nitrides, and nitrates, obtained by chemical combination of a metallic base.

As a matter of convenience, this category may include inorganic materials which are difficult to classify as metal, glass or ceramics.

Diamond and graphite are composed of carbon, and they are nonrecyclable crystalline materials. As a matter of convenience, they are included in this category.

Filled thermoplastics

This category includes thermoplastic resins containing fibers such as carbon fiber and glass fiber and/or powders such as talc in a proportion exceeding 5 weight percent. The filler concentration which would prevent the blended material from being recycled has been set at 5 weight percent.

PE

This refers to resin materials mainly consisting of polyethylene homopolymer, such as high-density polyethylene (HDPE), low-density polyethylene (LDPE), very-low-density polyethylene (VLDPE), linear low-density polyethylene (LLDPE), and ultrahigh molecular weight polyethylene (UHMW-PE).

PP

This refers to a resin materials mainly consisting of a polymer obtained by polymerizing propylene.

PS

This refers to a resin materials mainly consisting of a polymer with styrene as monomer.

PVC

This refers to a resin materials mainly consisting of a polymer obtained by polymerizing vinyl chloride (chloroethylene). There are two types of such resins: soft vinyl chloride resin containing a large amount of plasticizer and hard vinyl chloride resin containing only a small amount of plasticizer.

PC

This refers to a resin materials mainly consisting of a polymer having a carbonate group (-0-(C=0)-0-) for inter-monomer bonding. Although carbonate (carbonic ester) may be regarded as a kind of polyester, it shall be sorted out from bisphenol-A polycarbonate used for general purposes.

POM

This refers to resin materials mainly consisting of a polymer with oxymethylene (-CH2O-) as the unit structure. Like 1,3,5-trioxane (metaformaldehyde), it is a polymer of formaldehyde. There are two types of this polymer: homopolymer ([-CH2O-]n, paraformaldehyde) obtained by polymerizing formaldehyde only, and copolymer ([-CH2O-]n[-CH2CH2O-]m) containing oxymethylene (-CH2CH2O-) in a proportion of up to about 10 mol percent. Since both of them are treated as polyacetal or acetal resin, they shall be included in this category.

A(B)S

This refers to resin materials mainly consisting of a copolymer of acrylonitrile, (butadiene), and styrene. There are two methods of producing it: a ternary polymerizing technique by reaction of acrylonitrile, latex, and styrene; and a blending technique for compounding AS resin, rubber and additive in a mixer.

PA

This refers to resin materials mainly consisting of a polymer composed of a number of monomers connected by means of an amide linkage. Generally, it means polyamides with an aliphatic framework, which are collectively referred to as nylon resins. Since aromatic polyamides differ significantly in terms of their properties, they shall be classified in another category (“Other thermoplastic resins”).

PET

This refers to resin materials mainly consisting of a crystalline thermoplastic polymer, which is a kind of polyester made of ethylene glycol and terephthalic acid. A similar polymer called polybutylene terephthalate (PBT) exists, but it shall be included in the category “Other thermoplastic resins.”

PPE

This stands for polyphenylene ether (PPE) with an aromatic polyether structure, and this category also includes synthetic resins or polymer alloys mainly consisting of PPE and belonging to thermoplastic resins. PPE is seldom used alone. This category includes modified PPE alloyed with other synthetic resins such as high-impact polystyrene (HIPS).

Other thermoplastic resins

This category includes thermoplastic resins other than those mentioned above. It includes polymer alloys and blended resins.

PU(Polyurethane)

This refers to resin materials mainly consisting of a high molecular compound obtained by copolymerizing monomers in the urethane bond formed by the condensation of an isocyanate group and an alcohol group. Thermoplastic polyurethane exists, too, and may be included in this category. Its abbreviation for the plastics classification is PUR.

Unsaturated polyester

This is not a polymer formed by the condensation polymerization of monomers connected by an ester bond, like PET and PBT, but is a resin material mainly consisting of a reactant or a polymer substance of a monomer (unsaturated polyester) containing different allyl groups or vinyl groups in an ester bond. Monomeric drugs before being subjected to the reaction or polymerization are also called unsaturated polyesters, but they are not included in this category. ((Mixing agents)

EP(Epoxy resin)

This resin material mainly consists of a cured epoxide polymer resin that can be hardened by graft polymerization and crosslinking at its many epoxy groups when mixed with a catalyst or hardener. This is regarded as a reactant because it can be used for practical purposes when thermally hardened as a result of mixing with a prepolymer before graft polymerization and a hardener. Prepolymers are also called epoxy resin, but they are not included in this category. ((Mixing agents)

Other cured resinsOthers

This category includes cured resins other than those mentioned above (They are polymeric materials with a linear three-dimensional structure which becomes softer when heated and can be solidified through a chemical reaction. Once heated and solidified, this plastic material never melts even when heated again.)

(Not thermoplastic) Elastomer/Elastomer composites

This category includes natural rubber and synthetic rubber with a bridge structure, and composites consisting of such rubber.

High molecular composites (e.g., indecomposable laminated trim component)

This category includes cured-resin-based composites such as FRP. It generally includes cured resins containing fibers and inorganic fillers.

Resins/fibers contained in high molecular composites

Although resins and fibers contained in high molecular composites can be classified separately, they need not to be classified because high molecular composites are reported as homogeneous material included in parts of articles.

Wood

This term refers to for tree trunk-derived materials used for various purposes. This category includes not only solid wood but also wood-based materials such as plywood and wooden boards.

Paper This refers to thin, flat materials produced by pressing together plant fibers or the like. The Japanese Industrial Standards (JIS) define paper as “material produced by conglutinating plant fibers and other kinds of fibers.”

Fiber This term refers to thin, flexible and cohesive strings which grow naturally or are artificially extruded, such as animal hair and those obtained from animal leather and plants.

Leather

This category includes animal leather and its processed goods, excluding synthetic leather, artificial leather and other artificial materials simulating leather in form.

Other inorganic compounds

This category includes inorganic materials, such as silicon, which are difficult to classify as metal, glass or ceramics.

Diamond and graphite are composed of carbon, and they are nonrecyclable crystalline materials. For the sake of convenience, they are included in this category.

Gases (refrigerants, etc.)

This refers to materials which stay in a gaseous state at SATP(standard ambient temperature and pressure, 25°C (59°F) and 100.000 kPa)and are mainly utilized in that state.

This category includes refrigerant gases used in the refrigeration cycle, gas used in suspension mechanisms, atomizing medium for spray, etc.

They may be in a liquid state when contained in an article.

Liquids (ink, fat and oil, etc.)

This refers to materials which stay in a liquid state at SATP(standard ambient temperature and pressure, 25 °C (59 °F) and 100.000 kPa)and are mainly utilized in that state.

This category includes inks, lubricants, brake fluid, greases, etc.

Other materials (powder, etc.)

This category does not specify any properties of the materials included in it. It includes materials contained in an article in a powder state, such as toners in toner cartridges and fire extinguisher powder.

(Surface treatment)

Plating

Explanation regarding each metal species is omitted here.
Plating means a surface treatment or its process of coating a surface of metal or other materials with thin metal layers while being submerged.
There are several plating techniques such as electroplating, electroless plating and hot-dip plating.

Thermal spraying

This is a kind of surface treatment, and specifically it is the process of heating and melting a material and spraying it onto a substrate (base material), thereby forming a coating over it.

There are several thermal spray techniques, including flame spraying, wire flame spraying, powder flame spraying, ceramic rod flame spraying, detonation flame spraying, electric spraying, electric arc spraying, plasma spraying (low-pressure plasma spraying, atmospheric plasma spraying, water stability plasma spraying), wire explosion spraying, high velocity oxy-fuel flame spraying, and cold spraying.

Chemical conversion treatment

This is a kind of surface treatment, and specifically it is the process of applying a treating agent on the surface of a substrate or metal and bringing about a chemical reaction, thereby providing the substrate with additional properties such as corrosion resistance and affinity with coating materials. There are various types of such treatment, including electrochemical oxidation, oxidation reaction and sulfurization reaction by chemicals, coating made of oxides of aluminum, chrome, or zinc, and coating made of phosphates.

Chromate coating and hexavalent chrome treatment

Chromate treatment is applied to zinc, aluminum, etc. In this treatment, a metal material is dipped in a solution containing hexavalent chrome for passivation, thereby forming a self-repairing coating. The treatment provides chemical polishing as well.
Although the metal surface immediately after the treatment is in a gel state, it becomes a self-repairing and corrosion-resistant coating when dried at temperatures around 60℃.

Trivalent chromate treatment

Trivalent chromate is a form of processing generally applied after galvanization, in order to form a thin coating of trivalent chrome or chromate, thereby providing corrosion resistance.

Chrome-free treatment

This category includes materials which should not be disclosed in detail.

GEOMET treatment (chromium-free coating)

This is Nippon Dacro Shamrock (NDS)'s registered trade name for a chromium-free coating technique. Layers of metal flakes are connected with one another through the use of a special inorganic binder. The coating film is as thin as approximately 8μm.

Oxalic BONDE coating
This is a chemical conversion treatment using oxalic acid.

ZAY coating
This form of coating is included in classification for research in the automotive area. Its details are unknown at present.

Alumite treatment
This is a collective term for the techniques used to oxidize aluminum, which serves as an anode in an electrolytic process in strong acidic water, thereby coating the metal. It is also called anodic oxidation.

Alumite coating treatment
For aluminum sashes and other members used in a corrosive environment, the method of combined coating of anodic oxide and organic films is used. This method provides electrodeposition coating without sealing treatment.

Magnesium anticorrosion treatment
Generally, there are two methods of such treatment: electroplating with a zinc substituted layer as a substrate, and the direct application of electroless nickel. Under normal conditions, pinholes unavoidably occur on the plated coating and magnesium may be more corrosion-prone because it is a base metal. Therefore, in order to improve the corrosion resistance, the following processes may be performed: (1) Cu-Ni-Cr plating as thick as 25μm for interior items, (2) chromate treatment after electroless nickel plating, and (3) baking after plating.

Aluminum anticorrosion treatment
This refers to an anticorrosion treatment for aluminum excluding alumite.

Blackening (triiron tetroxide) treatment
This is a process of forming a triiron tetroxide coating on a product. In the process, a solution of thick sodium hydroxide mixed with a reaction accelerator and a dye is heated and boiled up to around 140℃ and the degreased and derusted product is soaked in the solution.

Phosphate treatment
This treatment protects the surface of a metal (mainly iron) by forming layers of various phosphate compounds over the surface.

CrN coating
This coating is a chrome film formed by ion plating, a kind of PVD process, in a nitrogen atmosphere.

DLC coating
Diamond-like carbon. It is a hard amorphous film consisting of hydrocarbon or carbon allotrope, substantially the same as hard carbon film. Generally, it is produced by the plasma CVD process or PVD process.

TiN coating
This is a titanium film formed by ion plating, a kind of PVD process, in a nitrogen atmosphere.

Coating of other inorganic compounds
This refers to the coating of metal oxides and inorganic compounds other than above. No specific examples are given.

Coated resins
This refers to resins coated by spray coating, electrostatic coating, electrodeposition coating, powder coating, etc. Printed ink and toner may be included in this category.

DACRO treatment
DACROTIZED is' a trade name registered by Nippon Dacro Shamrock (NDS). A DACROTIZED film is made by soaking a target substrate in a solution containing zinc as the main constituent and chromic acid as another constituent and heating the solution, thereby burning a film on to the substrate.

Coating (ceramics)
Ceramic coating, excluding chromium nitride, DLC and titanium nitride

Coating (glass)
Coating such as silicate treatment

Coating (other composites)
Coating with a combination of different materials, other than those mentioned above. No specific examples are given.

FAQ concerning the material classification

Q1 In which category should metal pastes or the like be classified?

A1 A metal paste in its original state is a preparation, and it is not subject to AIS description. A hardened metal paste used for the formation of a conductor generally contains a resin binder, which is a nonmetal material, in a proportion of about 10%. Therefore, classify such hardened metal paste as a metal material, such as “Precious metals and rare metals (Ag, Pt, Pd), excluding gold” and “Copper alloys (including brass).” Since the material classification “Copper” means highly pure copper only, copper contained in a copper paste should be classified in the “Copper alloys (including brass)” category regardless of level of purity.

Q2 In which category should silicone materials used as coating films or resin coatings be classified?

A2 Since silicone materials have a main chain of siloxane (chains of silicon and oxygen) and side chains of many alkyl groups such as the methyl group, they fall into the organic materials category.
Silicone resin coating materials generally possess the cured property. Therefore, put such a material in the category of “Other cured resins, rubber, and composites.”
For silicone baking finishing, choose “Coating resins” in the classification “Coating and Marking.”
If you need to mention a silane coupling treatment using alkoxysilane or the like (where it is often hard to specify the weight), choose the category “Coating (other composites)” although it is not necessarily appropriate.
It may be appropriate to add a new category for such chemical conversion treatment, but it will be necessary to consider in advance the correspondence with IMDS, JAMA sheets, etc. We would like to hear your comments on this matter.
A surface-hardened coating with a silicate material is considered to have silicon dioxide as the main constituent. Please put it in the c “Coating (glass)” category.

Q3 In which category should semiconductor silicon and semiconductor GaAs be classified?

A3 They are not as conductive as metal. They do not fall into the category of other inorganic compounds such as chloride and oxide because they are elements or alloys. Therefore, classify them in the “other nonferrous metals” category.

Q4 It would be easier to find the plating category if it comes after the nonferrous metals category.

A4 If it is placed near the nonferrous metals category, a surface treatment materials category might be selected by mistake when the base material should be classified. In order to avoid such a mistake, it has been placed in its current position.

Q5 When mixed, adhesive materials possess both thermoplastic and cured properties, and they are hard to classify.

A5 It is necessary to make a final decision taking recyclability and other aspects into consideration. Adhesive materials which possess a cured property are hard to recycle (although it is not yet possible to sort out adhesive materials for separate recycling). Therefore, put them in the category of “Other cured resin, rubber, and composites.”

Q6 Cellophane used as base material does not fall into any category of natural materials. In which category should it be put?

A6 Cellophane is a clear and filmy material made from cellulose. Put it in the “Other cured resins” category.

Q7 I don’t know which categories a thin film coating and an evaporation coating for lens should be put.

A7 There are new categories of “Gold evaporation (including sputtering),” “Evaporation coating (including sputtering) with precious metals and rare metals excluding gold,” and “Coating with other inorganic compounds.” Consider these categories when making a decision.

Q8 Polyimide resins used in FPC (Flexible Print Circuits) or the like are difficult to classify.

A8 The polyimide resin used in FPC is generally a cured resin. Put it in the “Other cured resins” category.

Q9 Description of a material and its purpose is not explicitly defined. In the case of ink printed on a product’s surface, for example, in which category should it be put?

A9 The options regarding purposes of materials include “coating” or “marking.” If ink is used as an overall coating, select “coating,” and if it is used for the printing of a model number or the like, select “marking.” It is considered that ink materials for both purposes consist of mixtures of pigment, filler, and thermoplastic or cured resin. However, it is not likely that resin coating will be stripped off or separated and then recycled. Accordingly, you may classify ink for both purposes in the “coating resin” category.

Q10 For the structure information regarding electric wires and cables, there should be a specific classification such as “Conductor,” “Insulator,” “Sheath,” “Jacket,” etc.

A10 In the part name section, you can enter “Conductor,” “Insulator,” “Sheath,” and “Jacket” as “base material.” Or, you can enter “Conductive wire,” “Sheath,” and “Jacket,” and identify the “Conductive wire” by a base material and a coating separately.

Q11 What are the differences between high-alloy steels and low-alloy steels?

A11 ISO 4946-1 and 2, which specify steel categorization, define steel as materials whose dominant element is iron containing carbon with 2.0wt% or less and other elements. Steels that contain aluminum, boron, magnesium, nickel, etc. exceeding the content specified for each of these elements are called alloy steels. As specified in the document entitled “Description of Material Classification List,” high-alloy steels refer to steels whose alloy content is 10wt% or more, but practically, only stainless steel and permalloy are applicable to this category.

Q12 Is it correct to classify ferrite magnet in the “non-alloy and low-alloy steels” category?

A12 Since ferrite is a ceramic, classify it in the “ceramic, N720” category.

Q13 Upstream suppliers do not provide material information. Is there a wild card category such as “other materials”?

A13 Wild card categories are not available. JAMP has established AIS to have it serve as a scheme that enables article manufacturers to provide information on the composition of products they are manufacturing. Business operators who manufacture original parts must be aware of the materials or substances contained. Accordingly, it will become possible to acquire information on materials used in original parts if you ask upstream manufacturers to communicate information downstream. However, it will frequently occur that information is interrupted in mid-course. In such cases, you may choose to classify steel in the middle classification “steel/cast steel/sintered alloy/cast iron” or the “cast iron” category, non-ferrous metals in the “other non-ferrous metals” category, nonmetals and inorganic materials in the “other inorganic compounds”, and resins in the “other thermoplastic resins” or the “other cured resins” category in place of wild cards.

Q14 Which materials must be selected as flame retardants, pigments, fillers, etc. used in mold resin?

A14 Select materials at the level of homogeneous materials. Because flame retardants, pigments and fillers used in mold resin are mechanically inseparable, they will fall under a certain thermoplastic or cured resin category. In the case where flame retardants, pigments, fillers, etc. contained in mold resin are subject to reporting, create reports for these substances.