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Glossary of terms used in surface treatments by dry processing

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Foreword

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Glossary of terms used in surface treatments by dry processing

1 Scope This Japanese Industrial Standard specifies the principal terms and their definitions used in surface treatment by dry processing.

2 Classification of terms The terms used in surface treatment by dry processing shall be classified into the following nine groups:

- (1) **Basis**
- (2) **Material and function**
- (3) **Physical vapor deposition method**
- (4) **Chemical vapor deposition method**
- (5) **Film formation method using melting state**
- (6) **Surface modification method**
- (7) **Surface processing method**
- (8) **Equipment and process**
- (9) **Test and inspection**

3 Terms and definitions The terms and their definitions shall be as follows.

Remarks : When two or more terms are given in parallel, they shall be used in order.

(1) Basis

No.	Term (Japanese character)	Reading	Definition	Reference
1001	表面処理	HYÔMEN-SYORI	The modification of surface property, the addition of new function and the like by changing the surface condition of material.	English equivalent surface treatment
1002	表面改質	HYÔMEN-KAISITU	(Broad sense) The same to surface treatment (refer to 1001). (Narrow sense) The addition of new function by changing surface itself of material.	surface modification
1003	ドライプロセス	DORAI-PUROSESU	The treatment of material surface by using of vapor phase or molten state. Informative reference : The treatment by using of aqueous solution or non-aqueous solution is referred to as wet process.	dry process
1004	真空	SINKÛ	The state in space filled with lower pressure of gas than ordinary atmospheric pressure. Informative reference : That is conveniently distinguished as follows, by region of pressure in order to express the degree of vacuum. Lower vacuum 10^2 Pa or higher Middle vacuum 10^2 Pa to 10^{-1} Pa Higher vacuum 10^{-1} Pa to 10^{-5} Pa Super higher vacuum 10^{-5} Pa to 10^{-10} Pa Ultra higher vacuum 10^{-10} Pa or lower	vacuum
1005	圧力	ATURYOKU	The total sum of component perpendicular to the surface of momentum conveyed, per unit area and per unit time, by the molecules passing through an imaginary micro plane containing a certain point in space from the both direction.	pressure

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
1006	分圧	BUN'ATU	The pressure of specific component in mixed gas (refer to 1005).	partial pressure	
1007	全圧	ZEN'ATU	The total sum of partial pressure (refer to 1006) of total component in mixed gas.	total pressure	
1008	飽和蒸気圧	HÔWA-ZYÔKIATU	The pressure indicated by vapor which reaches to thermodynamical equilibrium with the condensation phase at the temperature.	saturation vapor pressure	
1009	気体分子密度	KITAI-BUNSI-MITUDO	The number of gas molecules per unit area.	number density of molecules	
1010	平均自由行程	HEIKIN-ZIYÔ-KÔTEI	The average distance where a particle flies during successive collision when a particle (molecule, atom, electron, ion, neutron and the like) moving freely about in gas collides with the same or different particle successively.	mean free path	
1011	衝突頻度	SYÔTOTU-HINDO	The average number of collision that the particle moving freely about in gas is collided for unit time.	collision rate	
1012	体積衝突頻度	TAISEKI-SYÔTOTU-HINDO	The average number of inter-particle collision occurring in gas per unit time and per unit volume.	volume collision rate	
1013	吸着	KYÛTYAKU	A phenomenon in which the atoms or molecules of gas remain on the surface of solid or liquid.	adsorption	
1014	化学吸着	KAGAKU-KYÛTYAKU	The adsorption (refer to 1013) which forms chemical bond by exchanging electron between the atom of the first layer of surface and the adhered atom or molecule when atom or molecule adheres to the surface.	chemisorption	
1015	物理吸着	BUTURI-KYÛTYAKU	The adsorption (refer to 1013) by Van der Waals' force without delivery and receipt of electron between the atom of the first layer of surface and the adhered atom or molecule when atom or molecule adheres to the surface.	physisorption	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
1016	解離吸着	KAIRI-KYŪTYAKU	The chemisorption (refer to 1014) in which the adhered gas molecules are dissociated.	dissociative adsorption	
1017	平均滞留時間	HEIKIN-TAIRYŪ-ZIKAN	The average of time while the atoms or molecules of gas are restricted to surface in the state of adsorption, in brief, referred to as residence time.	mean residence time	
1018	脱離	DATURI	A phenomenon in which the atoms or molecules of gas adsorbed (refer to 1013) on surface or the atoms or molecules diffused from inside to surface have remained on the surface and then fly out to space.	desorption	
1019	付着確率	HUTYAKU-KAKURITU	The ratio of particles condensed on substrate (refer to 2001) to incident particle. Also, called as attachment coefficient.	sticking probability	
1020	入射速度	NYŪSYA-SOKUDO	The quantity of material impinged per unit area of surface and per unit time.	impingement rate	
1021	入射角	NYŪSYA-KAKU	The angle to normal line of the particle impinged from gas phase to substrate (refer to 2001).	angle of incident, incident angle	
1022	放電	HÔDEN	A phenomenon in which an electric current passes through an insulator of gas and the like due to strong electric field. Informative reference : That is classified into glow discharge (refer to 1023), arc discharge (refer to 1024) and corona discharge (refer to 1025) by pressure (refer to 1005) and the magnitude of electric current density, and direct current discharge, low frequency discharge, high frequency discharge and microwave discharge by the frequency of electric wave used. There are also magnetron discharge (refer to 1026), electron cyclotron resonance discharge (refer to 1027) and the like by adding magnetic field.	electric discharge	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
1023	グロー放電	GURÔ-HÔDEN	The dim discharge (refer to 1022) of lower ionization degree (refer to 1033) obtained at atmospheric pressure or under.	glow discharge	
1024	アーク放電	ÂKU-HÔDEN	The bright arc-shaped discharge (refer to 1022) of higher ionization degree (refer to 1033) obtained at atmospheric pressure or over or in a vacuum.	arc discharge	
1025	コロナ放電	KORONA-HÔDEN	The discharge (refer to 1022) accompanied by faint light obtained in the neighbourhood of conductor at the comparatively small average electric current of approximately 10^{-6} A or under.	corona discharge	
1026	マグネトロン放電	MAGUNETORON-HÔDEN	The discharge (refer to 1022) obtained in the neighbourhood of electrode where magnetic field and electric field cross at right angle.	magnetron discharge	
1027	電子サイクロトロン共振放電	DENSI-SAIKUROTORON-KYÔMEI-HÔDEN	The discharge (refer to 1022) obtained by resonating the electron in plasma of high frequency or microwave under a magnetic field.	electron cyclotron resonance (ECR) discharge	
1028	プラズマ	PURAZUMA	The gas composed of the charged particle such as ion, electron and the like of which the amount of total charge is zero and the neutral particle such as atom, molecule and the like.	plasma	
1029	平衡プラズマ, 高温プラズマ, 熱プラズマ	HEIKÔ-PURAZUMA, KÔON-PURAZUMA, NETU-PURAZUMA	The plasma (refer to 1028) of which the temperature of ion, electron and neutral particle is approximately equal. Informative reference : Referred to as high-temperature plasma or thermal plasma because the temperature of particle in plasma is the high temperature of about 10^4 K.	equilibrium plasma, high-temperature plasma, thermal plasma	
1030	非平衡プラズマ, 低温プラズマ	HI-HEIKÔ-PURAZUMA, TEION-PURAZUMA	The plasma (refer to 1028) in which the temperature of electron is much higher than that of ion and neutral particle. Informative reference : That is referred to as low-temperature plasma because the temperature of ion and neutral	non-equilibrium plasma, low-temperature plasma, cold plasma	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
			particle with high density is approximately several hundred K as compared with approximately 10 ⁴ K of the temperature of electron with lower density.		
1031	電離, イオン化	DENRI, ION-KA	A phenomenon to make electron fly out from atom or molecule by supplying energy such as electricity, light, etc. from outside to the electron composing atom or molecule. Informative reference: As the result, positive ions are generated.	ionization	
1032	電離エネルギー, イオン化エネルギー	DENRI-ENERUGĪ, ION-KA-ENERUGĪ	The minimum energy required for ionization (refer to 1031).	ionization energy	
1033	電離度, イオン化率	DENRIDO, ION-KA-RITU	The rate to indicate the degree of ionization in plasma. It is shown as $\frac{n_e}{(n_o + n_e)}$, where the density of neutral particle is n_o and the density of electron is n_e .	ionization degree	
1034	再結合	SAI-KETUGŌ	A phenomenon in which a positive ion becomes a neutral particle or a positive ion of lower charge number by colliding with electron. Informative reference: The reversed process of ionization (refer to 1031).	recombination	
1035	イオン再結合	ION-SAI-KETUGŌ	A phenomenon in which a positive ion becomes a neutral atom or molecule by colliding with a negative ion.	ion recombination	
1036	電子付着	DENSI-HUTYAKU	A phenomenon in which a negative ion is generated by attaching an electron to a neutral atom or molecule. Informative reference: That is referred to as electron attachment to discriminate from recombination (refer to 1034) for the case of positive ion and electron.	electron attachment	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
1037	脱離	DATURI	A phenomenon in which a negative ion detaches electron and returns to a neutral atom or molecule.	detachment	
1038	電子親和力	DENSI-SINWARYOKU	The energy released when electron combines with atom or molecule. That is equal to the energy required for detachment (refer to 1037).	electron affinity	
1039	ガス温度, 気体温度	GASU-ONDO, KITAI-ONDO	A measure indicating the average thermal movement energy of gas molecule in plasma (refer to 1028). Informative reference: This is generally lower than electron temperature (refer to 1040) in non-equilibrium plasma (refer to 1030).	gas temperature	
1040	電子温度	DENSI-ONDO	A measure indicating the average thermal movement energy of electron in plasma (refer to 1028).	electron temperature	
1041	イオン温度	ION-ONDO	A measure indicating the average thermal movement energy of ion in plasma (refer to 1028).	ion temperature	
1042	電子密度, プラズマ密度	DENSI-MITUDO, PURAZUMA-MITUDO	The number of electron per unit volume in plasma (refer to 1028).	electron density, plasma density	
1043	イオン密度	ION-MITUDO	The number of ion per unit volume in plasma (refer to 1028).	ion density	
1044	シース	SĪSU	The space charged layer formed around when solid exists in plasma (refer to 1028).	sheath	
1045	イオン源	ION-GEN	An equipment generating ion in gas phase. Informative reference: That is roughly classified by generating method of ion as follows:	ion source	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
			(1) Gas plasma type utilizing the electron collision ionization by gas discharge. (2) Surface effect type utilizing the mutual reaction between metal surface and atom. For the gas plasma type ion source, mostly, the ion is pulled out from the interface of the plasma (refer to 1028) formed by discharging (refer to 1022) and the typical types are duo plasmatron type ion source and Kaufman type ion source. For surface effect type ion source, the liquid metal ion source is known.		
1046	イオン電流	ION-DENRYŪ	An electric current by moving of ion.	ion current	
1047	イオン電流密度	ION-DENRYŪ-MITUDO	An ion current (refer to 1046) per unit area.	ion current density	
1048	ラジカル	RAZIKARU	An atom or molecule having unpaired electron.	radical	
1049	クラスタ	KURASUTA	A small aggregation formed by cohering several tens or to approximately one thousand molecules. Also, referred to as micro cluster.	cluster	
1050	クラスタイオン	KURASUTA-ION	The cluster (refer to 1049) having electric charge.	ionized cluster	

(2) Material and function

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
2001	基板	KIBAN	The solid which becomes the field to produce condensation when a thin film (refer to 2020) is formed by condensation from gas.	substrate	
2002	基板温度	KIBAN-ONDO	The surface temperature of substrate (refer to 2001) on which a film is formed.	substrate temperature	
2003	界面	KAIMEN	The boundary between two phases.	interface	
2004	表面粗さ	HYÔMEN-ARASA	The uneven condition exclusive of the undulation on solid surface.	surface roughness	
2005	平面度	HEIMENDO	The magnitude of difference from the geometrically correct plane in plane form.	flatness	
2006	清浄表面	SEIZYÔ-HYÔMEN	The surface not containing other material than the composed atom.	clean surface	
2007	表面構造	HYÔMEN-KÔZÔ	The arrangement of atom or molecule on the surface.	surface structure	
2008	結晶	KESSYÔ	The solid to be made so that atoms or molecules are regularly arranged.	crystal	
2009	単結晶	TANKESSYÔ	The solid in which all portion have crystallographically the same bearings.	single crystal	
2010	多結晶	TAKESSYÔ	The solid in which the single crystals (refer to 2009) having different bearings are aggregated.	polycrystal	
2011	結晶粒	KESSYÔRYU	The individual crystal (refer to 2008) composing polycrystal (refer to 2010).	crystal grain	
2012	結晶粒界	KESSYÔ-RYÛKAI	The boundary between crystal (refer to 2008) and crystal.	grain boundary	
2013	微結晶	BIKESSYÔ	The micro crystal (refer to 2008) of several n or under in size.	micro crystallite	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
2014	非晶質, アモルファス	HI-SYÔSITU, AMORUFASU	The amorphous state which has not the long distant regularity in the arrangement, the specific form nor structure of crystal.	amorphous state	
2015	再結晶	SAI-KESSYÔ	A phenomenon in which the generation and growth of new crystal nucleus can be observed when heated at over a certain temperature.	recrystallization	
2016	格子面	KÔSIMEN	A plane containing three or more lattice points which are not on the same line. Also, referred to as crystal plane. Informative reference : That is marked by Miller's index.	lattice plane	
2017	面方位	MEN-HÔI	The direction of lattice plane (refer to 2016). Informative reference : That is marked by Miller's index.	plane direction	
2018	等方性	TÔHÔSEI	The material property which is uniform independent of measured directions.	isotropy	
2019	異方性	I-HÔSEI	The material property which is different dependent of measured directions.	anisotropy	
2020	薄膜	USUMAKU	The film to approximately several μm in thickness.	thin film	
2021	厚膜	ATUMAKU	The film of approximately several μm or over in thickness.	thick film	
2022	連続薄膜	RENZOKU-USUMAKU	The thin film (refer to 2020) covering completely substrate (refer to 2001).	continuous thin film	
2023	不連続薄膜	HURENZOKU-USUMAKU	The thin film (refer to 2020) not covering completely substrate (refer to 2001).	discontinuous thin film	
2024	単層膜	TANSÔMAKU	The film composed of the same component.	single layer film	
2025	多層膜	TASÔMAKU	The film laminated by two or more types of single layer film (refer to 2024). Also, referred to as laminated film and accumulated film.	multilayer film	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
2026	表面拡散	HYÔMEN-KAKUSAN	A phenomenon in which surface atoms or surface-attached atoms move along the surface to more stable place in respect of energy. Also, referred to as surface migration.	surface diffusion	
2027	核	KAKU	The small aggregation of atom or molecule formed mainly at the time of crystallization or phase precipitation from supercooled phase or supersaturated phase.	nucleus	
2028	臨界核	RINKAI-KAKU	The nucleus (refer to 2027) is too small to grow or not to vanish when it is under a certain critical radius, even if generated, and the nucleus will be able to grow when it is over a certain radius. This term refers to the nucleus of the critical radius.	critical nucleus	
2029	核生成	KAKU-SEISEI	The formation of nucleus (refer to 2027) from supercooled phase or supersaturated phase. Informative reference : For the nucleation, the uniform nucleation and the non-uniform nucleation are known.	nucleation	
2030	核成長	KAKU-SEITYÔ	The growth of nucleus having critical radius or over in size among the formed nucleus (refer to 2027). Informative reference : For the nucleus growth, two-dimensional nucleus growth and three-dimensional nucleus growth are known.	nucleus growth	
2031	合体	GATTAI	The mutual unification of nucleus (refer to 2027) formed by nucleation (refer to 2029), at growing stage.	coalescence	
2032	薄膜成長	USUMAKU-SEITYÔ	The process in which the initial continuous thin film (refer to 2022) is formed and becomes thicker film. Informative reference : The growing mode of thin film (refer to 2020) is classified into the following three.	growth of thin film	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
			(1) The case where nucleus (refer to 2027) is formed at the initial stage of thin film growth and three-dimensional island structure (refer to 2039) is generated. (Volmer-Weber type) (2) The case where a layer growth is generated from the initial stage of growth. (Frank-van der Merwe type) (3) The case where some initial layers grow in layer and the nucleation (refer to 2029) is generated on the layer. (Stranski-Krastanov type)		
2033	被覆率	HIHUKURITU	The rate of covered area by covering material to the total area when other material covers on the surface of material.	coverage	
2034	シャドーイング	SYADÔINGU	A phenomenon in which the covering becomes difficult because atoms can not enter in the shadow part of projection on the substrate (refer to 2001) showing a complicated shape of surface such as integrated circuit.	shadowing	
2035	ステップカバレッジ	SUTEPPU-KABARÊZI	The coverage of thin film to the side of step at the portion where the form changes in step shape on the surface of substrate.	step coverage	
2036	回り込み	MAWARIKOMI	The coverage of film on the portion optically shadowed on the substrate (refer to 2001) [the back of substrate, the side of step, etc. against the evaporation source (refer to 3012)] by scattering of gas existing in space.	throwing power	
2037	成膜速度	SEIMAKU-SOKUDO	The increasing rate of thickness of film to be formed per unit time.	deposition rate	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
2038	モルフオロジ, モフォロジ	MORUFOROZI, MOFOROZI	The form of surface and section of formed film.	morphology	
2039	島状構造	SIMAZYÔ-KÔZÔ	The structure of thin film (refer to 2020) in which nucleus (refer to 2027) grows to become the aggregation of atom called as islands and these many islands are discontinuously distributed.	island structure	
2040	網目状構造	AMIMEZYÔ-KÔZÔ	The thin film (refer to 2020) in the state of connected islands by coalescing of islands to each other. Informative reference : The transfer ring step from island structure (refer to 2039) to continuous thin film (refer to 2022).	network structure	
2041	柱状構造	TYÛZYÔ-KÔZÔ	The structure of thin film (refer to 2020) in which columnar crystals (refer to 2008) grow against the substrate (refer to 2001).	columnar structure	
2042	繊維構造	SENTI-KÔZÔ	The structure of thin film (refer to 2020) in which crystals (refer to 2008) are oriented to one direction of crystal.	fiber structure	
2043	層状構造	SÔZYÔ-KÔZÔ	The structure of thin film (refer to 2020) in which different or the same type of atoms or molecules are laminated in layer.	layer structure	
2044	格子欠陥	KÔSI-KEKKAN	The disorder of regularity of crystal lattice arranged regularly. Informative reference : That is classified into spot defect (void, atom between lattices, etc.), linear defect (transfer), surface defect (lamination defect etc.) and so on by shape.	lattice defect	
2045	格子不整	KÔSI-HUSEI	The uncoincidence of lattice arrangement on the interface of atom layer with different atom arrangement.	lattice misfit	
2046	緩衝層	KANSYÔSÔ	A layer inserted between layers to relax the unadjustment between layers in each laminated layer.	buffer layer	
2047	ボイド	BOIDO	A spherical or polyhedral cave composed of gathering of empty holes.	void	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
2048	ピンホール	PIN-HÔRU	A micro-hole-shaped defect existing in thin film (refer to 2020).	pinhole	
2049	多孔率	TAKÔRITU	The rate of occupied volume of fine hole in the total volume of thin film (refer to 2020).	porosity	
2050	化学量論組成	KAGAKU-RYÔRON-SOSEI	The composition of compound indicated by molecular formula.	stoichiometry	
2051	組成こう(勾)配	SOSEI-KÔBAI	The continuous change of composition in film.	composition gradient	
2052	傾斜機能	KEISYA-KINÔ	The addition of new function of film by changing continuously the composition of film.	gradient function	
2053	配向性	HAIKÔSEI	The degree that the crystal direction of crystal particle in polycrystal indicates statistically a fixed direction.	orientation	
2054	優先配向	YUSEN-HAIKÔ	A phenomenon in which the crystal particles in polycrystal indicate statistically a fixed direction.	preferred orientation	
2055	サイズ効果	SAIZU-KÔKA	The difference in the property of material by dimension.	size effect	
2056	エピタキシン	EPITAKISI	A phenomenon in which the thin film (refer to 2020) has a certain relation of crystallographic direction against the crystal substrate of thin film.	epitaxy	
2057	エピタキシャル成長	EPITAKISYARU-SEITYÔ	The growth of single crystal thin film with the relation of regular crystal arrangement on the substrate of single crystal. Informative reference : The liquid phase type of epitaxial growth utilizing solid phase precipitation from super-saturated solution and the gas phase type of epitaxial growth utilizing solid phase precipitation from gas phase are known.	epitaxial growth	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
2058	エピタキシャル 温度	EPITAKISYARU- ONDO	The minimum temperature of substrate (refer to 2001) at the time of generating epitaxial growth (refer to 2057).	epitaxial temperature	
2059	ホモエピタキ シャル成長	HOMO- EPITAKISYARU- SEITYÔ	The epitaxial growth (refer to 2057) of single crystal thin film with the same type of material on the substrate of single crystal.	homoepitaxial growth	
2060	ヘテロエピタキ シャル成長	HETERO- EPITAKISYARU- SEITYÔ	The epitaxial growth (refer to 2057) of single crystal thin film with different type of material on the substrate of single crystal.	heteroepitaxial growth	
2061	グラフォエピタ キシャル成長	GURAFU- EPITAKISYARU- SEITYÔ	The formation of thin film (refer to 2020) of single crystal (refer to 2009) on the surface of substrate (refer to 2001) which has a certain geometrical regularity.	graphoeptaxial growth	
2062	超格子	TYÔKÔSI	The crystal lattice having the long period exceeding the period of atom arranged in lattice shape in crystal.	superlattice	
2063	ひずみ超格子	HIZUMI-TYÔKÔSI	The superlattice (refer to 2062) kept by the strain of lattice without relaxing unadjustment of lattice constant by combining the material with uncoincident lattice constant.	strained-layer superlattice	
2064	量子井戸構造	RYÔSI-IDO-KÔZÔ	When the material of large electron affinity (refer to 1038) is placed between the materials of small electron affinity, the bottom of conductive zone becomes like a box type of well and the electrons are shut in the bottom of well. The structure in which the thickness of well becomes smaller than the wavelength of electron and the energy of electron is quantized.	quantum well structure	
2065	量子井戸細線	RYÔSI-IDO-SASEN	The fine-wire shaped structure of which the dimensions of material in two directions are smaller than the wavelength of electron and in which two-dimensional quantum well structure (refer to 2064) is formed.	quantum well wire	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
2066	量子井戸箱	RYÔSI-IDOBAKO	The box-shaped structure of which the dimensions of material in three directions are smaller than the wavelength of electron, and in which three-dimensional quantum well structure (refer to 2064) is formed. Also, referred to as quantum box.	quantum well box	
2067	量子サイズ効果	RYÔSI-SAIZU-KÔKA	The size effect (refer to 2055) in which various physical properties appear by quantizing when the dimensions of material come to the same degree of wavelength of electron.	quantum size effect	
2068	二次元電子ガス	NIZIGEN-DENSI-GASU	The electron to be free in the direction parallel to interface, while electrons are shut in well layer in the direction vertical to interface in the one-dimensional quantum well structure (refer to 2064) and the energy is quantized. Informative reference : This exists in positive hole, which is called as two-dimensional positive hole gas.	two dimensional electron gas	
2069	ミニバンド	MINI-BANDO	The energy band formed in the following manner: When the thickness of barrier layer becomes thinner in the quantum well structure (refer to 2064) formed by superlattice (refer to 2062), the electrons shut in quantum well pass through the barrier layer by tunnel effect and expand in all superlattice, and the energy band is formed. Also, referred to as sub band.	mini-band	
2070	ゾーンの折返し	ZÔN NO ORIKAESI	The folding of Brillouin zone in electron structure in superlattice (refer to 2062) due to super periodic structure.	zone folding	
2071	表面機械的機能	HYÔMEN-KIKATEKI-KINÔ	The mechanical function indicated by surface. Informative reference : The thermal abrasion resistance property, frictional abrasion resistance property, adhesion property, lubrication property and the like are known.	surface mechanical functions	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
2072	表面熱の機能	HYÔMEN- NETUTEKI-KINÔ	The thermal function indicated by surface. Informative reference : The heat resistance property, thermal insulation property, thermal conductive property and the like are known.	surface thermal functions	
2073	表面電磁気の機能	HYÔMEN- DENZIKITEKI- KINÔ	The electromagnetic function indicated by surface. Informative reference : The conductive property, superconductive property, semiconductive property, electric insulation property, magnetic property and the like are known.	surface electric and magnetic functions	
2074	表面光学の機能	HYÔMEN- KÔGAKUTEKI- KINÔ	The optical function indicated by surface. Informative reference : Colour, gloss, luminance, light resistance, reflection-absorptive property, magneto-optical character, optical-recording character, liquid crystal orientation and the like are known.	surface optical functions	
2075	表面化学の機能	HYÔMEN- KAGAKUTEKI- KINÔ	The chemical function indicated by surface. Informative reference : The corrosion resistance, catalytic activity, sensor function and the like are known.	surface chemical functions	

(3) Physical vapor deposition method

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
3001	蒸着	ZYÔTYAKU	The formation of solid film on the substrate (refer to 2001) by adsorption (refer to 1013), aggregation and growth at the gas phase of material. Informative reference : This is conveniently classified into physical vapor deposition (refer to 3002) and chemical vapor deposition (refer to 4001).	vapor deposition	
3002	物理蒸着	BUTURI-ZYÔTYAKU	The formation of thin film (refer to 2020) by the following procedure: The materials are evaporated (refer to 3011) by the physical method such as high-temperature heating, sputtering (refer to 3047) and condensed on the substrate (refer to 2001). Also, referred to as physical gas phase growth. Abbreviation: PVD. Informative reference : Generic term of vacuum evaporation (refer to 3003), ion plating (refer to 3036), sputtering and the like.	physical vapor deposition	
3003	真空蒸着	SINKÛ-ZYÔTYAKU	The formation of thin film (refer to 2020) from the materials which are heated to evaporate in vacuum and condensed on the substrate (refer to 2001). Informative reference : The vacuum evaporation is so often called as vapor deposition in brief.	vacuum evaporation, evaporation	
3004	反応性蒸着	HAN'NÔSEI-ZYÔTYAKU	The preparation of compound thin film on the substrate as follows: The evaporation materials (refer to 3021) are evaporated (refer to 3011) in the atmosphere of active gas and the both are reacted. Also, referred to as chemical vapor deposition.	reactive deposition, reactive evaporation	
3005	斜め蒸着	NANAME-ZYÔTYAKU	The vapor deposition (refer to 3001) carried out by means of incidence of the evaporated atom or molecule at other angle than right angle to the surface.	oblique deposition	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
3006	同時蒸着	DÔZI-ZYÔTYAKU	The vapor deposition (refer to 3001) carried out by means of incidence of atoms or molecules evaporated at the same time and on the same surface of substrate from two or more evaporation sources (refer to 3012).	co-evaporation, multi-source evaporation	
3007	交互蒸着	KÔGO-ZYÔTYAKU	The preparation of multi-layer film (refer to 2025) carried out alternately by vapor deposition (refer to 3001) by use of two evaporation sources (refer to 3012).	alternating deposition	
3008	順次蒸着	ZYUNZI-ZYÔTYAKU	The preparation of multi-layer film (refer to 2025) carried out successively by vapor deposition (refer to 3001) from two or more evaporation sources (refer to 3012).	sequent deposition	
3009	低温蒸着	TEION-ZYÔTYAKU	The vapor deposition (refer to 3001) carried out while keeping the substrate (refer to 2001) at a low temperature.	low-temperature deposition	
3010	極低温蒸着	KYOKUTEION-ZYÔTYAKU	The vapor deposition (refer to 3001) carried out while cooling the substrate (refer to 2001) by very low temperature fluid such as liquid nitrogen.	very low temperature deposition	
3011	蒸発	ZYÔHATU	A phenomenon in which a portion of liquid or solid changes to gas (vapor) and comes out from the surface. Also, referred to as vaporization. Also, referred to as sublimation in the case of solid. Informative reference: The harmony evaporation, in which the composition of gas phase coincides with the composition of evaporation material (refer to 3021), and the non-harmony evaporation with their different composition are known.	evaporation	
3012	蒸発源	ZYÔHATUGEN	The mechanism to evaporate (refer to 3011) material by giving thermal energy.	evaporation source	

No.	Term (Japanese character)	Reading	Definition	Reference	
				English equivalent	
3013	点蒸発源	TEN- ZYÔHATUGEN	The spherical evaporation source (refer to 3012) being sufficiently small as comparing with vapor deposition distance.	point evaporation source	
3014	微小平面蒸発源	BISYÔ-HEIMEN- ZYÔHATUGEN	The evaporation source (refer to 3012) having evaporation area being sufficiently small as compared with vapor deposition distance. Informative reference: The direction distribution of evaporation material (refer to 3021) is in accordance with the cosine law of Knudsen.	small area evaporation source	
3015	リング蒸発源	RINGU- ZYÔHATUGEN	The evaporation source (refer to 3012) that a large number of point evaporation sources (refer to 3013) or small area evaporation sources (refer to 3014) are arranged in a ring.	ring evaporation source	
3016	自由蒸発源	ZIYÛ- ZYÔHATUGEN	The evaporation source (refer to 3012) with the structure so as the vapor evaporated (refer to 3011) from evaporation surface to be able to travel straight without scattering. Informative reference: This is the case where evaporation material (refer to 3021) is filled up to the upper surface of evaporation container.	free evaporation source	
3017	ノズル蒸発源	NOZURU- ZYÔHATUGEN	The evaporation source (refer to 3012) with the structure that a nozzle is attached to the spouting hole of container-type evaporation source and the vapor of evaporation material (refer to 3021) is spouted from the nozzle.	nozzle evaporation source	
3018	放射加熱蒸発源	HÔSYA-KANETU- ZYÔHATUGEN	The evaporation source (refer to 3012) that the evaporation material (refer to 3021) put in a container is heated to evaporate (refer to 3011) by thermal radiation.	radiant heating evaporation source	
3019	クヌーセンセル	KUNÛSEN-SERU	The evaporation source (refer to 3012) that a airtight box with small hole containing evaporation material (refer to 3021) is heated and the material is spouted from the hole in the state of molecular stream.	Knudsen cell	