BRITISH STANDARD

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Terms relating to surgical implants —

Part 3: Glossary of terms relating to materials

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Committees responsible for this British Standard

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British Institute of Surgical Technologists
British Medical Association
British Orthopaedic Association
British Steel Industry
British Surgical Trades Association Incorporated
Department of Health and Social Security
National Association of Drop Forgers and Stampers
Royal College of Surgeons of England
Royal Veterinary College
Society of Thoracic and Cardiovascular Surgeons

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Contents

Foreword

This British Standard has been prepared under the direction of the Surgical Instruments and Medical Equipment Standards Committee.

Advancements in the field of implant surgery proceed by the collaborative efforts of those skilled in a number of diverse activities, each having a specialized language. Definitions of terms relating to surgical implants were prepared with two main purposes in view, namely:

a) to promote precision and uniformity in the use of terms relating to the various aspects of surgical implants;

b) to enable workers in different fields to understand one another.

The intention has been to provide information on terms used in the biological, medical, engineering and materials science aspects of surgical implants. It is emphasized that many of the terms included in this Part of BS 6324 will be found in British Standards directly concerned with particular disciplines, as well as in many text books. The wording of these definitions has in some instances been modified to facilitate understanding of the concepts by readers who are not specialists in these particular disciplines; the definitions are not otherwise incompatible with the general definitions as used and understood in the relevant industries. Every attempt has been made to align the terms and definitions with modern practice. This glossary does not purport to be a comprehensive list of all terms used in connection with surgical implants and has been restricted to those terms most frequently used. Where terms are considered to be deprecated, this has been stated.

The glossary has been prepared in four Parts as follows:

— *Part 1: Glossary of general medical terms;*

— *Part 2: Glossary of terms relating to mechanics;*

— *Part 3: Glossary of terms relating to materials;*

— *Part 4: Glossary of orthopaedic surgical terms.*

Further consideration is being given to the preparation of other Parts covering such fields as cardiovascular, neurosurgical and genito-urinary implant surgery.

Attention is also drawn to the Parts of BS 3531 dealing with surgical implants.

Each term in the glossary has been allocated a number of the type 30101 where the first three digits indicate the section number and the first digit of that group indicates the Part of the glossary. The remaining two digits give the term number within the section.

Where two or more terms have the same meaning, the preferred term is given in bold type and the other terms are given in medium type.

An alphabetical index of the terms contained in each Part of the glossary is given at the end of that Part. Those terms given in italic typeface in the definitions are themselves defined elsewhere in the same Part and are included in the index for ease of reference.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 18, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 301. General

No.	Term	Definition
30101	**phase**	A region in a material differing from another in composition or structure or both.
30102	**phase diagram**	A diagram showing the *phases* present in a material, their compositions and their relative amounts as functions of temperature, pressure and overall composition. When each phase is at equilibrium with its surroundings the diagram is known as an equilibrium phase diagram.
30103	**matrix**	The major structural constituent of a material, i.e. the enveloping *phase* in which another phase is embedded. NOTE Contrast with intercellular substance (see Part 1 of this standard).
30104	**grain**	a) The crystalline structure of a material. b) One of the individual crystals in a polycrystalline material.
30105	**grain boundary** crystal boundary	The transition zone between crystalline alignments in two adjacent *grains*.
30106	**grain growth**	The coarsening of crystal structure, i.e. an increase in *grain* size, under certain conditions of heating.
30107	**inclusions**	Particles of impurities contained in a material.
30108	**extrusion**	The process of forcing material through a die, e.g. to form cylindrical pipes.
30109	**sintering**	The process by which a material in powder form is consolidated by raising the temperature to an appropriate value without producing a general liquid *phase*. NOTE Sintering of metals and plastics materials usually requires the application of pressure.
30110	**casting**	a) (verb). The process of forming a solid component by allowing a solution, solid-in-liquid suspension or molten material to solidify in a *mould* without the use of external pressure. b) (noun). The component formed during the casting process.
30111	**mould** die	An assembly of parts enclosing the space (cavity) from which the moulding takes its form.
30112	**compression moulding**	The process of moulding a material in a confined cavity by applying pressure and usually heat.
30113	**injection moulding**	The process of moulding a material by injection under pressure from a heated cylinder through a *sprue* (runner, gate) into the cavity of a closed *mould*.
30114	**sprue**	a) *In injection moulding*. That part of the feed immediately adjacent to the nozzle of the injection cylinder and connecting the nozzle to the runner. b) The primary feed channel that runs from the outer face of an *injection* or *transfer mould* to the mould gate in a single cavity mould or the runners in a multi-cavity mould. c) Moulding material in the primary feed channel.
30115	**flash**	a) That portion of a charge which escapes from the moulding cavity during moulding. b) Excess material that is formed between mating *mould* surfaces.

No.	Term	Definition
30116	**flash line**	The raised line appearing on the surface of a moulding and formed at the junction of *mould* parts.
30117	**moulding shrinkage**	The difference in linear dimensions between a moulding and the *mould* cavity in which it was moulded, both the mould and the moulding being at normal room temperature when measured.
30118	**isostatic pressing**	The compaction of a powder, enclosed in a flexible container, by means of a liquid under pressure.
30119	**hot isostatic pressing**	*Isostatic pressing* by means of a gas at high temperature.
30120	**electrophoretic deposition** electrodeposition	Surface coating from a dispersion by applying an electric charge to the surface to be coated to make it the electrode in a suitable cell.
30121	**bar**	A product of rectangular, circular, hexagonal or other section, usually rolled but also produced by *forging, casting* or machining.
30122	**sheet**	A cold-rolled flat product supplied in flat lengths.
30123	**strip**	A cold-rolled flat product supplied in long lengths in the coiled condition.
30124	**plate**	A hot-or cold-rolled flat product, of thickness greater than 3 mm, supplied in flat lengths.
30125	**welding**	That joining operation involving the melting of the materials at the interface between them.
30126	**wear**	The removal or transfer of material from contacting surfaces due to their relative movement under load. NOTE Wear may be measured by mass change, volume measurement or by the depth of wear tracks.
30127	**corrosion**	*Wear* caused by chemical attack.
30128	**abrasion**	The *wearing* of a surface by the mechanical action of solids. NOTE Contrast with the definition given in Part 1 of this standard.
30129	**erosion**	Surface *wear* caused by the mechanical action of a fluid, whether containing solid materials or not.
30130	**corrosion resistance**	The ability of a material to withstand chemical or electrochemical attack under specified environmental conditions.
30131	**intergranular corrosion** intercrystalline corrosion; grain boundary corrosion	*Corrosion* that occurs along *grain boundaries* between adjacent *grains;* resulting from differences between atoms in the boundaries and in the grains.
30132	**fretting corrosion**	Simultaneous action of the processes of fretting (see Part 2 of this standard) and *corrosion*.
30133	**stress corrosion**	Enhancement of the effect of a corrosive environment on a material by stress (see Part 2 of this standard).
30134	**stress corrosion cracking**	Brittle (see Part 2 of this standard) or quasi-brittle rupture of a material under the joint effect of static stress (see Part 2 of this standard) and corrosive attack, neither of which would have caused cracking whilst acting alone.
30135	**corrosion fatigue**	The failure due to repeated cycles of load (see Part 2 of this standard) in a corrosive environment. NOTE Generally in a corrosive environment, the number of load cycles to failure at a given stress (see Part 2 of this standard) is reduced, and there is no fatigue limit stress (see Part 2 of this standard).
30136	**crazing**	A network of surface cracks.
30137	**dimensional stability**	The capacity to retain original dimensions.

No.	Term	Definition
30138	**shrinkage**	A change in the dimensions of a product between initial solid forming and conclusion of the fabrication process.
30139	**plastic**	(adjective). The susceptibility of a material to plastic deformation (see Part 2 of this standard). NOTE Contrast with *plastics material*
30140	**permeability**	The ability to permit passage of gases or of small molecules in solution.
30141	**porous**	a) The condition of a material that contains pores or voids that may or may not be interconnected. b) The ability to permit passage of fluids by means of pores or voids in a material.
30142	**porosity**	The percentage ratio between the volume of space (void) within a material and the total volume occupied by the material including the spaces. NOTE This meaning of the term is related particularly to the materials used for synthetic vascular prostheses. Contrast with the definition given in 30324.
30143	**non-thrombogenic material**	Material which provides a non-clotting, non-haemolysing (see Part 1 of this standard) interface with blood.

Section 302. Metals: general

30201	**metal**	Material usually possessing the properties of electrical and thermal conductivity, opacity, lustre, hardness, ductility, malleability, and high melting and boiling points.
30202	**alloy**	a) Any *metal* other than a pure metallic element. b) A metal prepared by adding *alloying elements* to a basic metal to secure desirable properties.
30203	**alloying element**	A metallic or non-metallic element deliberately added for the purpose of modifying the properties of a *metal*.
30204	**alloying**	The addition of one or more *alloying elements* to a metallic product to form an *alloy*.
30205	**eutectic**	That mixture of two or more constituents which has the lowest freezing and melting points.
30206	**eutectic point**	That point in the *equilibrium phase diagram* indicating the composition of the *eutectic* and its freezing temperature.
30207	**eutectic structure**	The structure, frequently lamellar, produced by the simultaneous solidification of the components of the *eutectic*.
30208	**eutectoid**	That mixture of two or more constituents which forms on cooling from a solid solution and transforms on heating at a constant minimum temperature.
30209	**eutectoid point**	That point in the *equilibrium phase diagram* indicating the composition of the *eutectoid* and its temperature of transformation.
30210	**eutectoid structure**	The structure, frequently lamellar, produced by the simultaneous precipitation of the components of the *eutectoid* from the solid solution.

No.	Term	Definition
30211	**eutectoid steel**	Steel that consists entirely of *eutectoid*. NOTE In the iron/carbon system, the eutectoid occurs at approximately 0.9 % carbon and, after cooling at a suitable rate, consists entirely of *pearlite*.
30212	**transformation range**	That temperature range over which a significant change in *phase* structure occurs.
30213	**grain refining**	The process of diminution of *grain* size, involving heating at the *recrystallization temperature* (i.e. above the *transformation range*) followed by cooling at a suitable rate. NOTE *Hot working* and *cold working*, followed by *annealing*, are used for grain refining.
30214	**recrystallization temperature**	The temperature at which recrystallization takes place to a more stable strainfree crystal form. NOTE See *annealing*.
30215	**ferrite** alpha iron; α — iron	The crystal structure of iron stable at room temperature, having a body-centred cubic crystal lattice and being soft and ductile (see Part 2 of this standard). NOTE Solubility of carbon is very low in ferrite (below 0.02 %). Carbon steels up to 0.8 % carbon have ferrite as the *matrix phase*.
30216	**delta ferrite** δ — ferrite	The crystal form of iron stable above 1390 °C and having a body-centred cubic lattice. NOTE *Alloying* with certain elements (e.g. chromium) can modify the temperature range of stability of delta ferrite which can, under some circumstances, persist to normal ambient temperature and below.
30217	**austenite** gamma iron; Υ — iron	The crystal form of iron stable between 910 °C and 1390 °C and in which the unit cell has a face-centred cubic form. NOTE The range of stability can be changed markedly by *alloying*, and in *austenitic stainless steel* stability is maintained at normal ambient temperature.
30218	**iron carbide** cementite; carbide	The *phase* formed when carbon is present in excess of solubility limits and having an orthorhombic lattice with a 3 : 1 iron to carbon ratio.
30219	**pearlite**	A mixture of two *phases* formed by transforming *austenite* of *eutectoid* composition to *ferrite* and *iron carbide* by heat treatment. NOTE Microscopically, pearlite has a lamellar structure. Transformation begins at *grain boundaries*.
30220	**pearlitic steel**	Carbon steel containing 0.02 % to 0.9 % carbon. NOTE *Pearlite* is present in small quantities in low-carbon steels and increases in quantity as the level of carbon is increased until, in a plain carbon steel containing about 0.83 % carbon, the structure consists entirely of pearlite.
30221	**bainite**	Steel in crystal form produced when *austenite* is *quenched* to a temperature between 200 °C and 400 °C.
30222	**martensite**	Steel in crystal form produced when *austenite* is *quenched* below the temperature for *bainite* formation. NOTE The face-centred lattice changes to a body-centred lattice, but since the carbon remains in solution it is a tetragonal structure rather than cubic. With sufficient time, transformation to *ferrite* plus *iron carbide* occurs at low temperatures, but not to a *pearlite* structure.
30223	**dendrite**	A crystal with a fir-tree-like structure formed from a nucleus where first solidification occurred (adjective: dendritic.)

No.	Term	Definition
30224	**stainless steel** corrosion-resisting steel	A steel alloy whose composition is such that it resists *corrosion*. NOTE Such steels contain substantial quantities of chromium with the addition of nickel and other elements.
30225	**austenitic stainless steel**	*Stainless steel* in which the crystalline structure is substantially one *phase austenite*.

Section 303. Metals: technology and processing

30301	**quenching**	The process of rapid cooling, carried out over any temperature range to achieve a desired structure. (adjective: quenched.)
30302	**normalizing**	The process of slow cooling to produce the low-temperature equilibrium forms of *ferrite* and *iron carbide*.
30303	**solution treatment** solutionizing	The process of putting minor components into solid solution by holding the *alloy* at a suitable temperature, usually just below the *eutectic* temperature.
30304	**precipitation hardening**	The process by which an *alloy* is *solution treated*, then *quenched* to retain the solid solution followed by heating to a suitable temperature to nucleate precipitation of the minor component.
30305	**stress relief annealing**	The process of heating to temperatures just below the *eutectoid* to relieve stresses.
30306	**annealing**	A process of heat treatment comprising heating a metal above its *recrystallization temperature* and cooling at a suitable controlled rate to produce recrystallization and softening.
30307	**transformation hardening**	A process of hardening comprising cooling from above the *transformation range* at a rate that prevents the formation of *ferrite* and *pearlite* and results in the formation of *martensite*. NOTE Cooling may be in water, oil or air.
30308	**cold work**	Deformation occurring below the *recrystallization temperature* of the crystal lattice, usually producing increase of hardness (see Part 2 of this standard) and reduction of ductility. NOTE See also *strain hardening*.
30309	**strain hardening**	Hardening caused by deformation at some temperature below the *recrystallization temperature* and usually at ambient temperature. NOTE See also *cold work*.
30310	**hot work**	Deformation occurring above the *recrystallization temperature;* hardening does not occur since recrystallization accompanies the deformation.
30311	**forging**	a) The process of hammering or pressing between dies at any predetermined temperature. b) The product of a forging process.
30312	**weld decay**	*Intergranular corrosion* of an *austenitic stainless steel* in the neighbourhood of a weld, the susceptibility having been caused by the *welding* heat.
30313	**weld decay test**	A test to determine the susceptibility of steel to *weld decay*.

No.	Term	Definition
30314	**investment casting**	The process of *casting* into a *mould* produced by the use of an expendable pattern.
30315	**master melt**	The product of a single furnace charge, usually in the form of an *ingot* or cast *bar*, intended for further processing.
30316	**unit cast**	The product of a single furnace charge used to produce a single batch of *castings* in the same *mould*.
30317	**re-melting stock**	*Metal* supplied in cast or wrought form, the chemical composition of which has been established by analysis.
30318	**vacuum melting**	Melting in a crucible (usually by electric induction) contained in a sealed chamber in which the pressure is sufficiently below the normal atmospheric level to prevent oxidation of reactive elements.
30319	**vacuum casting**	The process of *casting* into a *mould* contained within a chamber so that the reduced pressure is maintained throughout the time the *metal* is molten. NOTE For certain *alloys* partial repressurization with a suitable inert gas may be necessary.
30320	**vacuum re-melting**	The re-melting of *metal* (the chemical composition of which has been established by analysis) under vacuum or reduced pressure conditions to preclude any possible changes in chemical composition.
30321	**electro-slag refining** electro-flux refining	That method of melting or re-melting in which an electrode of predetermined composition is progressively melted whilst immersed in a protective, electrically conductive and often refining molten slag through which the droplets of melted *metal* fall to coalesce and solidify as a new metal *ingot*.
30322	**ingot**	The as-cast product of a single *master melt* or re-melt.
30323	**billet**	A semi-finished wrought product intended for rolling or *forging,* usually square in cross section.
30324	**porosity**	a) A system of interconnecting or closed cavities which may occur within a metal structure. b) A defect consisting of interconnecting or closed cavities which may be formed during casting. NOTE Contrast with the definition given in 30142.

Section 304. Metals: corrosion

30401	**sensitization**	That condition of *stainless steel* resulting from incorrect heat treatment which renders it susceptible to *intergranular corrosion*.
30402	**de-sensitization**	The process of reducing *sensitization* of *austenitic stainless steel* by suitable heat treatment. NOTE De-sensitization is typically achieved by: a) heating to a temperature high enough to give solution of the *iron carbides* (usually 1 050 °C) followed by cooling at a sufficiently rapid rate to prevent their reformation; or b) heating at a temperature in the region of 850 °C to 900 °C for a time sufficient to give homogenization of the chromium in solid solution.
30403	**upsetting test**	A test for the detection of surface defects, used to determine the suitability of *billets, bars,* wire, etc., for hot or cold *forging* and involving hammering a specimen on end until it is shortened by a specified amount.

No.	Term	Definition
30404	**passivation**	The production of a passive film on the surface of a *metal* in order to resist *corrosion,* usually by the production of an oxide film, by chemical or electrical treatment.

Section 305. Plastics materials: general

30501	**plastics material**	Material that contains, as an essential ingredient, a high molecular mass *polymer* and which at some stage in its processing into finished products can be shaped by flow. NOTE Contrast with *plastic.*
30502	**natural resin**	A member of the group of glassy, amorphous, organic solids, secreted by certain plants and insects, insoluble in water but soluble in many organic solvents and softening under heat; e.g. colophony.
30503	**synthetic resin**	A term originally applied to members of a group of synthetic substances which resemble and share some of the properties of *natural resins*, but now applied in a wider sense to include materials which bear little resemblance to natural resins. NOTE It refers generally to the products of *step growth polymerization* used for example, as surface coatings (e.g. alkyd resins, *epoxy resins*).
30504	**thermoplastic**	(adjective). Capable of being repeatedly softened by heating and hardened by cooling through a temperature range characteristic of the *plastics material* and, in the softened state, of being repeatedly shaped by flow into articles by *moulding, extrusion* or forming.
30505	**thermoplastic resin**	A *synthetic resin* that will soften when heated and can then be processed by *extrusion or moulding.*
30506	**thermosetting**	(adjective). Capable of being changed into a substantially infusible and insoluble product when *cured* by heat.
30507	**thermosetting resin** thermoset	A *plastics material* that, when *cured* by heat, changes into a substantially infusible and insoluble product.
30508	**crosslinking**	The process of multiple intermolecular covalent or ionic bonding between *polymer* chains.
30509	**elastomer**	A macromolecular material, such as a synthetic rubber or rubber-like *polymer,* which returns rapidly to approximately its initial dimensions and shape after substantial deformation by a weak stress and release of the stress. (adjective: elastomeric.)
30510	**fibre-forming polymer**	A *polymer* from which continuous filaments can be formed and comprising a regular chain structure permitting close alignment of neighbouring chains and development of cumulatively strong intermolecular forces.
30511	**crystalline polymer**	A *polymer* in which regularity of structure permits alignment of neighbouring chain molecules into regions of high structural regularity or crystallinity. NOTE *Polyethylene* is a crystalline polymer and its mechanical and physical properties are very dependent upon the amount of crystallinity present.
30512	**composite** reinforced plastics material	A solid product consisting of two or more discrete physical *phases,* including a binding material (*matrix*) and a particulate, fibrous or laminar material.

No.	Term	Definition
30513	**inert plastics material**	a) In chemistry. *Plastics material* that is non-reactive in a given chemical situation. b) In medicine. Plastics material that does not react with the tissue in any way after implantation and is itself unaffected. NOTE to b) This is a theoretical concept used in reference to levels of tissue acceptance or tolerance. The only true test is complete tissue tolerance by the host tissues over the lifetime of the recipient.
30514	**benign reactivity**	Of an implant material. The occurrence of any reaction or interaction with the body tissues without any adverse effect upon the recipient of the implant. NOTE The reaction may be strong and play an active part in the healing processes.

Section 306. Plastics materials: polymer chemistry

30601	**monomer**	A compound, the molecules of which can provide one or more constituent units of a *polymer*. (adjective: monomeric.)
30602	**polymer**	A substance, the molecules of which are characterized by the multiple repetition of one or more atoms or groups of atoms (constituent units) linked to each other in amounts sufficient to provide a set of properties that do not vary markedly with the addition or removal of one or a few of the constituent units.
30603	**high polymer**	A *polymer* of a given series, whose physical properties, especially its viscoelastic properties (see Part 2 of this standard), do not vary markedly with the relative molecular mass.
30604	**homopolymer**	A *polymer* derived from one *monomer*.
30605	**copolymer**	A *polymer* derived from more than one *monomer*.
30606	**polymerization**	The process of converting a *monomer* or a mixture of monomers into a *polymer*.
30607	**step growth polymerization**	The incorporation of molecules step-by-step into a chain of progressively increasing size, with or without the elimination of simple molecules.
30608	**polycondensation** condensation polymerization	*Polymerization* by a repeated condensation process, i.e. with the elimination of simple molecules such as water.
30609	**addition polymerization** polyaddition	*Polymerization* by a repeated addition process.
30610	**chain growth polymerization**	The rapid formation of large molecules by a free radical or ionic mechanism, usually from *monomers* containing ethylenic double bonds.
30611	**initiator**	A chemical compound added to a *monomer* to start *polymerization* usually by the formation of free radicals or ions. NOTE Initiators are degraded or incorporated into the *polymer* (contrast with *catalyst*).
30612	**catalyst**	A substance, used in small proportions, that augments the rate of a chemical reaction, and in theory remains unchanged chemically at the end of the reaction. NOTE Contrast with *initiator*.

No.	Term	Definition
30613	**accelerator** promotor	A substance used in small proportions to increase the reaction rate of a chemical system.
30614	**hardening agent** hardener	A *curing* agent that promotes or regulates the curing reaction of *resins* in the formation of rigid (hard) products.
30615	**inhibitor**	A substance added to *monomers* to prevent *polymerization* during storage.

Section 307. Plastics materials: technology

30701	**compounding**	The incorporation of ingredients to modify specific *polymer* properties. NOTE An example of the use of compounding is to improve resistance to degradation.
30702	**milling**	A process used to soften *polymers* in which the material is passed between rollers, usually heated and rotating at different speeds. NOTE Additives may be incorporated during the process.
30703	**anti-oxidant**	A substance used to retard the deterioration of *plastics materials* caused by oxidation.
30704	**ultra-violet stabilizer**	A substance added to *plastics materials* to inhibit degradation induced by ultra-violet radiation. NOTE It acts either by chemical action on initial products of degradation, or as a selective absorber of radiation.
30705	**anti-static agent**	A material added to *rubbers* and *plastics materials* to make them electrically conductive and thus to reduce hazards arising from build-up of static electricity, e.g. fine particles of carbon may be incorporated into rubbers intended for anaesthetic use. NOTE Anti-static properties may deteriorate after a few months of use.
30706	**plasticizer**	A substance of low or negligible volatility incorporated in *plastics material* to lower its softening range and to increase its workability, flexibility or extensibility.
30707	**plastisol**	A stabilized dispersion of *polymer* powder in a *plasticizing* liquid in which, on heating, the polymer absorbs the liquid and swells to produce a coherent solid mass.
30708	**filler** reinforcing filler	A relatively inert solid material, such as woodflour or china clay, which is added to a *plastics material* to modify its strength, permanence, working properties or other qualities, or to reduce costs.
30709	**stock** stock rubber	Uncured *rubber*.
30710	**encapsulation** potting	The process of covering a device with a *monomer* or low molecular mass *polymer* coating which is subsequently *polymerized* or *crosslinked*.
30711	**calendering**	The preparation of sheet *rubber* or *plastics materials* of predetermined thickness by passing between rollers usually revolving at the same rate. NOTE It may be used to coat cloth or other backing material.
30712	**dip coating**	A coating process in which a substrate is dipped into a fluid *polymer* solution or dispersion, then withdrawn and subjected to heating and drying to solidify the deposited film.

No.	Term	Definition
30713	**dipping**	The process of coating a *mould* by dipping it into a solution or latex of *rubber* or *plastics materials.*
30714	**mandrel coating**	The application of *polymer* solution to a slowly rotating solid rod or former (mandrel) followed by solvent evaporation. NOTE It is used for making tubing of non-extrudable materials.
30715	**transfer moulding**	The process of moulding a thermosetting material by passage from a heated pot into the cavity of a closed, heated mould.
30716	**rotational moulding**	The process of forming hollow articles by adding powdered or *plastisol polymer* to a *mould* which is rotated simultaneously in two planes perpendicular to each other while being heated.
30717	**blow moulding**	A process in which a hollow tube of *plastics material* is expanded into a *mould* in which it is enclosed by applications of high-pressure air inside the tube.
30718	**mould release agent** parting agent; lubricant	A substance, such as wax or *silicone* oil, which is used to coat a *mould* cavity or added to the moulding material to facilitate removal of the moulded product from the mould.
30719	**cellular plastics material** expanded plastics material; foamed plastics material	*Plastics material* the density of which is reduced by the presence of numerous cavities (cells), interconnecting or not, dispersed throughout the material.
30720	**chemically foamed plastics material**	*Cellular plastics material* in which the cells are formed by gases generated from thermal decomposition or chemical reaction of the constituents.
30721	**mechanically foamed plastics material**	*Cellular plastics material* in which the cells are formed by the physical incorporation of gases.
30722	**thermoforming**	The process of shaping heated *thermoplastic* sheets or other profiles, generally on a *mould,* followed by cooling.
30723	**vacuum thermoforming**	A *thermoforming* process in which a vacuum is used to form a heated sheet against the *mould* surface.
30724	**curing** hardening	The process of converting a prepolymeric or polymeric composition into a more stable, usable condition by *polymerization* and/or *crosslinking.*
30725	**post-curing** secondary curing	A process of *curing,* following *crosslinking,* carried out under controlled temperature and intended to enhance the physical properties of the material and/or remove decomposition products.
30726	**pot life** working life	The period of time during which an adhesive or resin prepared for application remains usable.
30727	**dough time**	The time required from the commencement of mixing of an adhesive or resin, such as *acrylic bone cement,* to form a coherent dough.
30728	**setting time**	The time required from the commencement of mixing of an adhesive or resin for the material to harden sufficiently for handling. NOTE It is not necessarily representative of complete *curing.*
30729	**spinning**	The process of producing *high polymeric* fibres by the production of filaments from molten *polymer* or from solution.

No.	Term	Definition
30730	**cold drawing**	The stretching of a filament to produce intermolecular alignment and consequent increase in tensile strength (see Part 2 of this standard).
30731	**post shrinkage**	The shrinkage of a plastics product after moulding and during post-treatment, storage or use.

Section 308. Types of rubber and plastics materials

30801	**natural rubber** hevea rubber	Natural cis-*polyisoprene,* obtained as a latex from the rubber tree *Hevea brasiliensis*.
30802	**silicone** polysiloxane	A *polymer* in which the main chain consists of alternating silicon and oxygen atoms with organic side groups.
30803	**silicone compound**	A material made from *silicone* that has been compounded with suitable *fillers* and *crosslinking* agents, prior to crosslinking.
30804	**silicone elastomer**	A rubber-like material derived from a *silicone* compound which has been *crosslinked* or heat vulcanized and, where applicable, *post-cured*.
30805	**polyurethane**	A *polymer* in which the repeated constituent unit in the chain is of the urethane type (-NH-CO-O-). NOTE Polyurethane synthetic rubbers are prepared typically by the reaction of a difunctional alcohol and a diisocyanate.
30806	**neoprene** polychloroprene	A synthetic rubber comprising polymers of 2-chloro 1 : 3-butadiene (chloroprene).
30807	**polyisoprene** isoprene rubber	A synthetic *rubber* comprising synthetic *cis*-polyisoprene prepared by stereo-regular *polymerization* of isoprene.
30808	**tissue adhesive**	An adhesive used primarily as an alternative to sutures (see Part 1 of this standard) for blood vessels and soft tissues.
30809	**acrylic plastics material**	A *plastics material* based on polymers derived from acrylic acid or a structural derivative of acrylic acid, or their *copolymers* with other *monomers,* the acrylic monomer(s) being in the greatest amount by mass.
30810	**polymethylmethacrylate**	A *thermoplastic* material composed of *polymers* of methylmethacrylate.
30811	**acrylic cement** acrylic bone cement; bone cement	Two-component cement that commences to harden at room temperature, comprising a liquid component (usually methylmethacrylate *monomer* containing an amine or other activator of the *initiator*) and a solid component which is a fine powder of *polymethylmethacrylate copolymer* containing a *polymerization* initiator. NOTE Bone cement used in orthopaedic surgery is normally of this type (see BS 3531-7).
30812	**cyanoacrylate adhesive**	An adhesive containing liquid *monomers* of alkyl α-cyanoacrylate esters and which is characterized by very rapid *polymerization* initiated by moisture. NOTE This type of adhesive is sensitive to hydrolytic breakdown, giving formaldehyde, and therefore is toxic to tissues to some degree.
30813	**vinyl polymer**	A *thermoplastic polymer* formed by *polymerization* of chemical compounds containing the group $CH_2 = CH–$.

No.	Term	Definition
30814	**polyvinyl chloride**	A *thermoplastic polymer* composed of polymers of vinyl chloride.
30815	**polyvinylidene chloride**	A *thermoplastic polymer* composed of polymers of vinylidene chloride.
30816	**polystyrene**	A *thermoplastic polymer* based on polymers of *styrene* (*vinyl benzene*) or *copolymers* of styrene with other *monomers,* styrene being in the greatest amount.
30817	**polyvinyl alcohol**	A *thermoplastic polymer* composed of polymers of the hypothetical vinyl alcohol and which is soluble in water when the content of hydroxyl groups in the polymer is sufficiently high. NOTE It is obtained by partial or complete hydrolysis of polyvinyl esters, usually by complete hydrolysis of polyvinyl acetate.
30818	**polyolefin**	A *thermoplastic polymer* prepared by *polymerization* of olefins, the most common being ethylene and propylene.
30819	**polyethylene** polyethene	A *thermoplastic polymer* of ethylene (ethene) and which is normally a translucent, tough waxy solid, unaffected by water and by a large range of chemicals.
30820	**low-density polyethylene (LDPE)**	A low molecular mass *polyethylene* made by a high-pressure process in which the chains carry short branches and in which closeness of packing and thus the density is reduced, typically to a value of 910 kg/m^3 to 925 kg/m^3. NOTE Crystallinity still occurs, giving toughness and chemical resistance.
30821	**high-density polyethylene (HDPE)**	A high molecular mass *polyethylene* in which the molecules are sterically very regular and unbranched, permitting close packing, and thus a high density, typically above 940 kg/m^3.
30822	**ultra-high molecular weight polyethylene (UHMWPE)** ultra-high molecular mass polyethylene	A very high molecular mass *polyethylene,* typically of density 930 kg/m^3 to 944 kg/m^3, which is preferred for surgical use in loadbearing applications, such as in joint prostheses (see Parts 4 and 1 of this standard).
30823	**polypropylene** polypropene	A *thermoplastic polymer* of propylene (propene).
30824	**fluoropolymer**	A *polymer* consisting of monomers containing one or more atoms of fluorine or copolymers of such monomers with other monomers, the fluoromonomer(s) being in the greatest amount.
30825	**polytetrafluoroethylene (PTFE)**	A *polymer* of tetrafluoroethylene.
30826	**polyester**	A *polymer* in which the repeated constituent unit in the chain is of the ester type (-CO-O-).
30827	**linear polyester**	A *polyester* composed usually of *polyethyleneterephthalate,* or less commonly polypropyleneterephthalate and polyhexyleneterephthalate and which forms strong fibres and monofilaments, and tough high-gloss biaxially orientated unsupported films.
30828	**polyester resin**	A material that contains double bonds in the *polymer* chain arising from the unsaturated carboxylic acids used in its manufacture. NOTE Commonly it is dissolved in a polymerizable solvent, usually *styrene* (*vinyl benzene*), and hardens when a *polymerization initiator* is added. In this form it is widely used in the preparation of glass fibre reinforced *plastics material*

No.	Term	Definition
30829	**polyamide**	A *polymer* in which the repeated constituent unit in the chain is of the amide type (-NH-CO-).
30830	**polyethyleneterephthalate (PETP)**	A *polymer* made by the *polycondensation* of ethylene glycol and dimethyl-terephthalic acid.
30831	**nylon**	A generic name for all synthetic fibre-forming *polyamides*. NOTE They can be formed into monofilaments and yarns characterized by great toughness, strength and elasticity, high melting point and good resistance to water and chemicals.
30832	**polyimide**	A *polymer* containing cyclic structures in the macromolecular chain, prepared by the reaction between a diamine and an anhydride. NOTE Aromatic diamines impart good thermal stability.
30833	**epoxy resin**	A material prepared typically by the reaction of epichlorhydrin with diphenylolpropane to give a diglycidyl ether, the epoxide groups in which will react further, usually with amines, to give infusible insoluble products.
30834	**polyacetal**	A *polymer,* derived from formaldehyde, with the general formula $H(O\text{-}CHR_1\text{-}O\text{-}R_2)_n$ OH and prepared by the reaction of difunctional alcohols with aldehydes.
30835	**polycarbonate**	A *thermoplastic polymer* prepared by the reaction between phosgene and diphenylolpropane, and in which the repeated constituent unit in the chain is of the carbonate type $H(O\text{-}CO\text{-}O\text{-}R)_n$ OH.
30836	**hydrophilic polymer** hydrogel	A type of *polymer* which swells in water to become soft and pliable and is typically a *crosslinked* polymer of hydroxyethylmethacrylate.
30837	**polyglycolic acid**	A linear *polymer* of glycolic acid used for sutures (see Part 1 of this standard). NOTE It hydrolyses in vivo (see Part 1 of this standard) and is completely absorbable.
30838	**carbon fibre**	A fibre produced from organic fibre by pyrolysis under controlled conditions.

Section 309. Bioplasts

30901	**bioplast**	An organic material prepared from high molecular mass materials of biological origin, having short duration use as a surgical implant, and being progressively absorbed.
30902	**fibrin bioplast**	A *bioplast* made from the protein (fibrin) formed during blood clotting from fibrinogen in the presence of thrombin (see Part 1 of this standard). NOTE It is *plasticized* with water and can be moulded into shaped articles and *crosslinked* with formaldehyde.
30903	**collagen bioplast**	A *bioplast* made from the major protein (collagen) of skin, connective tissue and bone (see Part 1 of this standard).
30904	**lyophilized bone bioplast**	A *bioplast* made from substantially protein-free dried bone (bovine) and which is non-antigenic since residual protein has been denatured.
30905	**alginates**	Calcium and sodium salts of alginic acid obtained from seaweed.
30906	**gelatin**	A degradation product of collagen produced by hydrolysis. NOTE It is obtained from bones and hides by soaking in lime water followed by rigorous purification.

No.	Term	Definition
30907	**starch sponge**	A *bioplast* prepared from starch by slow freezing followed by freeze drying.
30908	**catgut**	A *bioplast* suture (see Part 1 of this standard) material prepared from the serosa (a non-vascular collagenous tissue) of sheep.

Section 310. Ceramics

31001	**ceramic**	An inorganic, non-metallic, principally or totally crystalline solid that is fabricated or shaped by powder processes and consolidated by a final heat treatment.
31002	**glass**	An inorganic non-metallic material that has been produced by fusion and subsequent cooling, the fused mass becoming rigid without crystallizing.
31003	**bioglass**	*Glass,* some components of which are soluble in body tissues.
31004	**green state**	The state of a *ceramic* that is shaped but unfired.
31005	**dry state**	The state of a *ceramic* after drying and before firing.
31006	**binder**	A substance added to a relatively non-plastic material to give it workability and green and/or dry strength; normally removed during firing.
31007	**alumina ceramic**	A *ceramic* based on alumina (Al_2O_3). NOTE Alumina ceramics containing a high proportion of alumina (see BS 3531-8) are commonly used in orthopaedic surgery.
31008	**apatite ceramic**	A *ceramic* based on apatite (calcium phosphate).

Alphabetical index

The method of alphabetization used in this index is word-by-word.

Entries beginning with the same word are listed in the order:

a) a single word entry;

b) the same word modified by a qualifier;

c) compound entries beginning with the same word.

The references are not to page numbers, but to term numbers. The word "see" against an entry indicates that the term itself is not defined but that information on the term may be found in the indicated entry.

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Publications referred to

BS 6324, *Terms relating to surgical implants.*

BS 6324-1, *Glossary of general medical terms.*

BS 6324-2, *Glossary of terms relating to mechanics.*

BS 6324-4, *Glossary of orthopaedic surgical terms.*

BS 3531, *Surgical implants.*

BS 3531-1, *Specification for basic requirements: finish, marking and packaging*[1)].

BS 3531-2, *Specification for materials for metal surgical implants*[1)].

BS 3531-3, *Specification for forged components made of wrought stainless steel, wrought titanium and of wrought titanium alloy*[1)].

BS 3531-4, *Specification for castings made of cobalt-chromium-molybdenum alloy*[1)].

BS 3531-5, *Specification for surgical bone screws of 4 mm, 3.5 mm and 3 mm nominal sizes, countersunk surfaces on bone plates, twist drills, taps and screwdrivers*[1)].

BS 3531-6, *Specification for skeletal pins and wires*[1)].

BS 3531-7, *Specification for acrylic bone cement.*

BS 3531-8, *Specification for ceramic materials based on alumina.*

BS 3531-9, *Specification for general requirements for orthopaedic joint replacements*[1)].

BS 3531-10, *Specification for classification, designation of dimensions and general requirements for partial and total hip joint replacements*[1)].

BS 3531-11, *Specification for staples for use in orthopaedic surgery*[1)].

BS 3531-12, *Classification and designation of dimensions for knee joint prostheses*[1)].

[1)] Referred to in the foreword only.

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