Glossary Biocompatible materials LV 308.016

Additive manufacturing	Defined by ASTM as the "process of joining materials to make objects from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing methodologies, such as traditional machining. Synonyms: additive fabrication, additive processes, additive techniques, additive layer manufacturing, layer manufacturing and freeform fabrication".
Additives (polymer)	Substances added to a polymers to obtain improvement in specific properties.
Alginate	Anionic polysaccharide distributed widely in the cell walls of brown algae, where it, through binding water, forms a viscous gum. In extracted form it absorbs water quickly.
Allergy	Unwanted immune response to a substance which is usually harmless in itself and that causes specific symptoms in a predisposed person. There are to date 4 recognised types of allergic reactions based on different subclasses of antibodies.
Allogeneic	(Former: homologous), originating from an animal of the same species i.e., material from a genetic different individual of the same species.
Alloy	A blend of two or more metals, which usually enables the material to have a wider range of properties.
Alloplastic	In the context of implants this means the implantation of synthetic foreign materials, that are made from non-biogene materials (metals, ceramics, polymers). These materials are tissue friendly.
Alumina	An oxide of aluminum (Al_2O_3) that occurs native as corundum and in hydrated forms (as in bauxite).
Amalgam	Mercury based alloy made by combining elemental mercury, silver, tin, copper and possibly other metallic elements. It is typically used as dental filling material.
Amorphous	Materials whose order extends only to nearest neighbour atom, i.e., which possess no regular structure.
Annealing	Heat treatment process that reverses the changes in the microstructure of a metal after cold working; occurs in 3 stages that are recovery, recrystallisation, and grain growth.
Antibody	Any of a large number of proteins of high molecular weight that are produced normally by specialised B cells after stimulation by an antigen and act specifically against the antigen in an immune response, that are produced abnormally by some cancer cells, and that typically consist of four subunits including two heavy chains and two light chains—called also *immunoglobulin.*
Antigen	Any substance foreign to the body that evokes an immune response either alone or after forming a complex with a larger molecule (as a protein) and that is capable of binding with a product (as an antibody or T cell) of the immune response.
Antisepsis	The inhibiting of the growth and multiplication of micro-organisms by antiseptic means.
Apotosis	A genetically determined process of cell self-destruction that is marked by the fragmentation of nuclear DNA, is activated either by the presence of a stimulus or by the removal of a stimulus or suppressing agent, is a normal physiological process eliminating DNA-damaged, superfluous, or unwanted cells (as immune cells targeted against the self in the development of self-tolerance or larval cells in amphibians undergoing metamorphosis), and when halted (as by genetic mutation) may result in uncontrolled cell growth and tumor formation—called also *programmed cell death.*

Arthroplasty	Surgical restoration of a joint when it is badly damaged by arthritis (most cause) or other causes (e.g., malformation, abnormal development, injury).
Aseptic loosening	This process occurs when small particles are generated at the bearing surfaces of a joint replacement. The particles attract macrophages, that try to engulf and digest the particles, since they are seen as 'foreign' to the body. The cells die because they are incapable of digesting the particles, and release enzymes and other chemicals that dissolve the bone substance (osteolysis) around a prosthesis.
Autogeneous	(Former: autologous), body's own material i.e., originating from the same individual. (e.g., the donor is the recipient too like with a skin graft).
Basal membrane	Interface between connective tissue and other tissues like muscle fibres, epithelium, or nervous tissue.
Bioactive	Positive interaction with tissue that leads to cellular differentiation, e.g., reaction with bone implants: attachment or adhesion of bone along the interface between implant and tissue.
Bio-based materials	Are derived from living organisms and constitute mostly an energy reserve of the organism, e.g., natural polymers.
Biocompatible	Release of substances in non-toxic concentrations. Body's reaction may result in encapsulation with connective tissue, and moderate foreign body reactions (giant cells), but the target is not to trigger an immune response.
Biocompatibility	The ability of a material to perform with an appropriate host response in a specific application i.e., the extent to which a material or device implanted in the body is well tolerated by the recipient tissue. This applies particularly to the tolerance between a technical and a biological system. It is divided into structure compatibility and surface compatibility. Biocompatibility testing as a pre-clinical application stage has to be done according to specific standards (e.g., USP, ISO 10993, EN 30993 or DIN EN ISO 7405).
Biocorrosion	Deterioration in metals caused by a biological agent.
Biodegradation	Change of a chemical compound to a less complex compound by means of a biological agent.
Bioerosion	Physical changes in size, shape, or mass of a device, which could be the consequence either of degradation or simply dissolution, resulting from the action of a biological agent.
Biofunctionality	Substitution of one or more functions of the biological system by a technical system.
Bioinert	Materials which do not initiate a response or interact when introduced to biological tissue. Even though there is no detrimental effect due to a material being bioinert, it may mean that the tissue does not attach to the material as well as it may to a bioactive material.
Biological materials	Are produced by living creatures including bone, blood, muscle, and other materials.
Biomaterial	A non-viable material, used in a medical device, intended to interact with biological systems (ESB).
Biomaterials science	Encompasses elements of biology, medicine, chemistry, physics, mechanics and materials science.
Biomimetic material	Materials that are not produced by a living organism but are chemically and physically similar to ones that are.
Blood	The fluid that circulates in the heart, arteries, capillaries, and veins of a vertebrate animal carrying nourishment and oxygen to and bringing away waste products from all parts of the body. In vertebrates, it is

	composed of blood cells suspended in a liquid called blood plasma. Plasma, which constitutes 55% of blood fluid, is mostly water (92% by volume), and contains dissipated proteins, glucose, mineral ions, hormones, carbon dioxide (plasma being the main medium for excretory product transportation), platelets and blood cells themselves. The blood cells are mainly red blood cells (also called RBCs or erythrocytes) and white blood cells (WBCs), including leukocytes and platelets.
Bone	One of the hard parts of the skeleton of a vertebrate. Bone tissue is a type of dense connective tissue. Bones come in a variety of shapes and have a complex internal and external structure. The hard outer layer of bones (compacta) is composed of compact (dense) bone tissue. The interior of the bone (spongiosa) is the trabecular bone tissue (an open cell porous network also called cancellous or spongy bone), which is composed of a network of rod- and plate-like elements.
Bone cement	Fills the free space between the prosthesis and the bone. Bone cements are provided as two-component materials consisting of a liquid and a powder.
Braces (dental)	Orthodontic appliances that help align and straighten teeth and help to position them with regard to a person's bite.
Brittleness	Tendency of a material to fracture or fail upon loading without significant deformation.
Carcinogenicity	Tendency of a material or compound to induce cancer.
Caries	Tooth decay caused by microorganisms.
Cartilage	Flexible connective tissue found in many areas in the bodies of humans and other animals.
Casting	Processing step by which a piece is brought into the desired shape by (melting and) pouring the liquefied material into a mould.
Cell	Smallest unit of life that is classified as a living thing.
Cellulose	Is the structural component of the primary cell wall of green plants, many forms of algae and the oomycetes. It is a polysaccharide comprising up to thousands of linked glucose units.
Cement	Any material capable of binding things together.
Cementum	Bony material layer in teeth that primarily provides a point of attachment for the periodontal ligaments.
Ceramics	Compounds that contain metallic atoms bonded to non-metallic atoms such as oxygen, carbon, or nitrogen. The bonds can be ionic or covalent.
Chain scission	The cleavage of polymer chains, as a result of e.g., heating, irradiation, mechanical stress ...
Chemotaxis	Orientation or movement of an organism or cell in relation to chemical agents.
Chitin	A horny polysaccharide that forms part of the hard outer integument especially of insects, arachnids, and crustaceans.
Chitosan	Linear polysaccharide derived from chitin by deacetylation.
Chondrocyte	Round cartilage cell that produces and maintains the cartilaginous matrix.
Chondroblasts	Term used to describe an immature chondrocyte, a star like cell.
Coagulation (Blood)	Complex process by which blood forms clots.

Cold working	Deforming a material above its yield strength but below the recystallisation temperature, resulting in an increased yield strength but decreased ductility. It is also known as strain hardening.
Collagen	Is the main component of connective tissue, and is the most abundant protein in mammals. Three protein chains with counterclockwise helix structure are twisted into a right-handed triple helix (superhelix).
Combination (polymer)	Two polymer chain ends simply couple together to form one long chain.
Composites	Are engineered or naturally occurring materials made from two or more constituent materials with significantly different physical or chemical properties which remain separate and distinct at the macroscopic or microscopic scale within the finished structure.
Compression moulding	A method of moulding in which the moulding material, generally preheated, is first placed in an open, heated mould cavity. The mould is closed with a top force or plug member, pressure is applied to force the material into contact with all mould areas, while heat and pressure are maintained until the moulding material has cured.
Conductive	Material serves as a scaffold for bone deposition, but only in osteogenic environment.
Connective tissue	A tissue of mesodermal origin that consists of various cells (as fibroblasts and macrophages) and interlacing protein fibres (as of collagen) embedded in a chiefly carbohydrate ground substance, that supports, ensheathes, and binds together other tissues, and that includes loose and dense forms (as adipose tissue, tendons, ligaments, and aponeuroses) and specialized forms (as cartilage and bone).
Corrosion	A process in which a solid, especially a metal, is broken down or destroyed by a chemical action, as in the oxidation of iron in the presence of water by an electrolytic process.
Creep	The tendency of a solid material to slowly move or deform permanently under the influence of stresses. It occurs as a result of long term exposure to high levels of stress that are below the yield strength of the material. Creep is more severe in materials that are subjected to heat for long periods, and near melting point. Creep always increases with temperature.
Cross-linking	To join (adjacent chains of a polymer or protein) by creating covalent bonds.
Crystal	A homogenous solid formed by a repeating, three-dimensional pattern of atoms, ions, or molecules and having fixed distances between constituent parts.
Curing	Term in polymer chemistry and process engineering that refers to the toughening or hardening of a polymer material by cross-linking of polymer chains, brought about by chemical additives, ultraviolet radiation, electron beam or heat. In rubber, the curing process is also called vulcanisation.
Cytotoxicity	Quality of being toxic to cells.
Degeneration	Change in cellular structures or functions due to damage to the cell.
Degradation	Change of a chemical compound to a less complex compound.
Dental cement	Type of dental material that can be used for different purposes as to restore dental work or to create original dental work.
Dentin	A calcareous material similar to bone but harder and denser that composes the principal mass of a tooth, is formed by the odontoblasts of the surface of the dental papilla, and consists of a matrix containing minute parallel tubules which open into the pulp cavity and during life contain processes of the cells of the pulp.

Dentures	Artificial replacements for one or more teeth; *especially* **:** a set of false teeth—called also *dental plate.*
Determination (cell)	The fixation of the destiny of undifferentiated embryonic tissue.
Differentiation (cell)	Transition of an immature to a mature tissue. At the cellular level this means the take over of new morphological and functional properties, by which the cell differs from other less mature cells (Langmann, 1970).
Disinfection	Any process, chemical or physical, that destroys pathogens such that an item is safe to handle for its intended use.
Disinfectant	A chemical agent that destroys most pathogens but may not kill bacterial spores. Disinfectants Are used on inanimate objects only and not on living tissue. Chemicals used to kill microorganisms on skin or living tissue are known as antiseptics.
Disproportionation	A hydrogen atom from one polymer chain end is abstracted to another, producing a polymer with a terminal unsaturated group and a polymer with a terminal saturated group.
Ductility	The ability of a material to withstand plastic deformation without rupture. Ductile materials show in principle large deformation before fracture occurs.
Elastic (material behaviour)	A material that returns to its original shape after the stress (e.g. external forces) that made it deform or distort is removed.
Elastic modulus	A measure of the stiffness of an elastic material and is a quantity used to characterise materials. It is defined as the ratio of the uniaxial stress over the uniaxial strain in the range of stress in which Hooke's Law holds (also: Young’s modulus, modulus of elasticity, tensile modulus).
Elastin	A protein in connective tissue that is elastic and allows many tissues in the body to resume their shape after stretching or contracting.
Elastomer	Any material, such as natural or synthetic rubber, that is able to resume its original shape when a deforming force is removed. This property results from the presence of loosely crosslinked polymer chains.
Encapsulation	The firm, generally avascular collagen shell deposited around a foreign body, effectively isolating it from the host tissues. This response was developed as a protective measure. Encapsulation is especially problematic for devices designed to interact with the body.
Endosseous implant	Any object, such as a dental implant, placed or contained within a bone.
Endocytosis	The uptake by a cell of material from the environment by invagination of its plasma membrane; it includes both phagocytosis and pinocytosis.
Endosteum	The layer of vascular connective tissue lining the medullary cavities of bone
Endothelium	The layer of epithelial cells that lines the cavities of the heart, the serous cavities, and the lumina of the blood and lymph vessels.
Enamel	The intensely hard calcareous substance that forms a thin layer partly covering the teeth of many vertebrates including humans, is the hardest substance of the animal body, and consists of minute prisms secreted by ameloblasts, arranged at right angles to the surface, and bound together by a cement substance.
Environmental stress cracking	Premature initiation of cracking and embrittlement of a plastic due to the simultaneous action of stress and strain and contact with specific chemical environments (abbreviated ESC).

Enzyme	Any of numerous proteins or conjugated proteins produced by living organisms and functioning as specialised catalysts for biochemical reactions.
Epithelium	Membranous tissue composed of one or more layers of cells separated by very little intercellular substance and forming the covering of most internal and external surfaces of the body and its organs.
Erosion	Physical changes in size, shape, or mass of a device, which could be the consequence either of degradation or simply dissolution.
Erythrocytes	Mature red blood cells (having lost their nucleus) intervening in the oxygen transport to the cells.
Exocytosis	A process of cellular secretion or excretion in which substances contained in vesicles are discharged from the cell by fusion of the vesicular membrane with the outer cell membrane.
Extracellular matrix	The extracellular part of animal tissue that usually provides structural support to the animal cells in addition to performing various other important functions.
Extensive property (material)	A property of a system that is directly proportional to the system size or the amount of material in the system.
Extrinsic property (material)	A not essential property of a material.
Extrusion	A process used to create objects of a fixed cross-sectional profile. A material is pushed or drawn through a die of the desired cross-section. The two main advantages of this process over other manufacturing processes are its ability to create very complex cross-sections and work materials that are brittle, because the material only encounters compressive and shear stresses. Commonly extruded materials include metals, polymers, ceramics, concrete and foodstuffs.
Fatigue	The progressive and localised structural damage that occurs when a material is subjected to cyclic loading. The nominal maximum stress values are less than the ultimate tensile stress limit, and may be below the yield stress limit of the material.
Fibrin	An elastic, insoluble, whitish protein produced by the action of thrombin on fibrinogen and forming an interlacing fibrous network in the coagulation of blood.
Fibroblast	An immature cell type belonging to the connective tissue.
Fibrocyte	A spindle-shaped cell of fibrous tissue and the mature form of a fibroblast.
Foreign body reaction	A granulomatous inflammatory response evoked by the presence of a foreign body (or something that has been identified as “non-self” by the immune system) in the tissues; a characteristic feature of this is the formation of foreign body giant cells.
Forging	Manufacturing process involving the shaping of metal using localised compressive forces. Forging is often classified according to the temperature at which it is performed: "'cold," "warm," or "hot" forging.
Genotoxicity	Quality of being harmful to DNA: pertaining to agents known to damage DNA, thereby causing mutations, which can result in cancer.
Glass	Amorphous (non-crystalline) solid material. Glasses are typically brittle and optically transparent.
Glass ceramics	Polycrystalline material produced through controlled crystallisation of base glass. Glass-ceramic materials share many properties with both glasses and ceramics.
Glass transition temperature	The reversible transition in amorphous materials (or in amorphous regions within semicrystalline materials) from a hard and relatively brittle state into a molten or rubber-like state.

Granulocyte	A polymorphonuclear white blood cell with granule-containing cytoplasm.
Ground substance	The intercellular substance of tissues, i.e. a more or less homogeneous matrix in which the specific differentiated elements of a system are suspended.
Haemocompatibilty	The extent to which a material or device implanted in the body is well tolerated by the blood and its constituents.
Haemolysis	Destruction or dissolution of red blood cells with liberation of haemoglobin.
Haematoxicity	Quality of being poisonous to the blood and haematopoietic system.
Hemiarthroplasty	Arthroplasty in which one joint surface is replaced with an artificial material.
Heterotopic	Occurring in an abnormal place.
Histocompatibility	The extent to which a material or device implanted in the body is well tolerated by the surrounding tissue.
Histotoxicity	Quality of being toxic to tissue.
Homoelasticity	Approach of the stiffness of an implant to that of bone in order to minimise the strain miss-match between bone and implant.
Hyaluronic acid	An anionic, nonsulphated glycosaminoglycan distributed widely throughout connective, epithelial, and neural tissues (also: hyaluronan, hyaluronate).
Hybrid fixation	Fixation technique for endoprostheses in which one part is fixed cementless while another part is cemented.
Hydrogels	A network of polymer chains that are hydrophilic, sometimes found as a colloidal gel in which water is the dispersion medium.
Hydroxyapatite	A naturally occurring mineral form of calcium apatite with the formula $Ca_5(PO_4)_3(OH)$, but is usually written $Ca_{10}(PO_4)_6(OH)_2$ to denote that the crystal unit cell comprises two entities.
Hypersensitivity	Undesirable reactions produced by the normal immune system, that is abnormal susceptible physiologically to a specific agent (as a drug or antigen). Can be separated into immediate and delayed hypersensitivity.
Immune response	White blood cells identifying a foreign material in the body and attempting to destroy it by humoral and cellular activity.
Implant	An implant is a material, a component or a material or component system that is placed in the body on the other side of the skin or mucus barrier. This includes the anchoring and/or allocation of the inner and outer surfaces of the body. Under consideration of the “biocompatibility” aspects (structure and surface compatibility) all applications of materials or components on the skin and the mucus are included. Depending on the implantation duration one can distinguish among ultra-short-time, short-time and long-time implants (Wintermantel). Any medical device made from one or more materials that is intentionally placed within the body, either totally or partially buried beneath an epithelial surface (ESB).
Implantation	Action by which avital organs or tissue, and non-biological materials are introduced in the body.
Incompatible	Release of substances in toxic concentrations or antigens, that elicit immune reactions.
Infection	The state produced by the establishment of an infective agent in or on a suitable host.
Inflammation	A local response to cellular injury that is marked by capillary dilatation, leukocytic infiltration, redness, heat, pain, swelling, and often loss of

	function and that serves as a mechanism initiating the elimination of noxious agents and of damaged tissue.
Indication	A symptom or particular circumstance that refers to the advisability or necessity of a specific medical treatment or procedure.
Induction	Cause cells to differentiate into a specific direction. Triggering a process of growth or differentiation of a cell group by the action of another group of cells or an exogenous stimulus or an osteoinductive implant.
Inductive	Induction of heterotopic bone formation.
Inert (material)	Inactive, does not trigger foreign reactions.
Injection moulding	A manufacturing process for producing parts from both thermoplastic and thermosetting plastic materials. Material is fed into a heated barrel, mixed, and forced into a mould cavity where it cools and hardens to the configuration of the cavity.
Inlay	In dentistry, a filling made outside the tooth to correspond with the cavity form and then cemented into the tooth.
Intensive property (material)	A physical property of a system that does not depend on the system size or the amount of material in the system.
Intrinsic property (material)	An essential property of a material itself. It is independent of how much of the material is present and is independent of the form the material.
Joint	The point of contact between elements of an animal skeleton whether movable or rigidly fixed together with the surrounding and supporting parts (as membranes, tendons, or ligaments).
Keratoprosthesis	A plastic replacement for an opacified inner part of a cornea.
Ligament	A tough band of tissue that serves to connect the articular extremities of bones or to support or retain an organ in place and is usually composed of coarse bundles of dense white fibrous tissue parallel or closely interlaced, pliant, and flexible, but not extensible.
Lymphocyte	Any of the colourless weakly motile cells that originate from stem cells and differentiate in lymphoid tissue (as of the thymus or bone marrow), that are the typical cellular elements of lymph, that include the cellular mediators of immunity, and that constitute 20 to 30 percent of the white blood cells of normal human blood (can be separated into B cells and T cells).
Leukocytes	White blood cells intervening in the immune response.
Macrophage	A large white blood cell, found primarily in the bloodstream and connective tissue, that helps the body fight off infections by ingesting the disease-causing organism.
Matrix (composite materials)	Material in a composite that protects, orients, and transfers the load to the reinforcing material.
Megakaryocyte	A large cell that has a lobulated nucleus, is found especially in the bone marrow, and is the source of blood platelets.
Melting	Physical process that results in the phase change of a substance from a solid to a liquid.
Mesenchym	The meshwork of embryonic connective tissue in the mesoderm from which are formed the connective tissues of the body and the blood and lymphatic vessels.
Metal	An element, compound, or alloy composed of an arrangement of positive ions surrounded by a sea of delocalised electrons (metallic bonds).
Mineralisation	Integration of minerals in animal tissues, physiological process occurring primarily in bone tissue.

Monocyte	A large white blood cell with finely granulated chromatin dispersed throughout the nucleus that is formed in the bone marrow, enters the blood, and migrates into the connective tissue where it differentiates into a macrophage.
Muscle	A body tissue consisting of long cells that contract when stimulated and produce motion (cardiac muscle, smooth muscle, striated muscle).
Necking	Sudden decrease in cross-sectional area of a region of a sample under tensile stress.
Necrosis	Death of living tissue; *specifically*: death of a portion of tissue differentially affected by local injury (as loss of blood supply, corrosion, burning, or the local lesion of a disease).
Nervous tissue	Main component of the nervous system - the brain, spinal cord, and nerves-which regulates and controls body functions. It is composed of neurons, which transmit impulses, and the neuroglia cells, which assist propagation of the nerve impulse as well as provide nutrients to the neuron. Nervous tissue is made of nerve cells that come in many varieties, all of which are distinctly characteristic by the axon or long stem like part of the cell that sends action potential signals to the next cell.
Nitinol	Ni-Ti alloy used in e.g., stent manufacture that experiences a shape memory effect (SME).
Onlay	A metal covering attached to a tooth to restore one or more of its surfaces.
Ophthalmology	Medical discipline dealing with malfunctions and diseases of the eye and its related structures.
Opsonisation	Process by which the body identifies the materials/agents to be phagocytosed by coating or labelling them with specific proteins.
Orthodontics	A branch of dentistry dealing with irregularities of the teeth (as malocclusion) and their correction (as by braces).
Osseointegration	The firm anchoring of a surgical implant (as in dentistry or in bone surgery) by the growth of bone around it without fibrous tissue formation at the interface.
Ossification	Generation and development (covering in a broader sense also regeneration) of bone, that can be separated primarily into chrondral and desmal ossification. The generation of bone begins at the perichondrium of the existing cartilage. It proceeds as a two step chondral ossification, i.e. first growing of the mesenchymal perichondrium, differentiation of mesenchymal cells into osteoblasts, and production of osteoids and ground substance, and generation of the perichondral bone sleeve. In the second step cells from the periostal connective tissue and blood vessels grow into the cartilage of the diaphysis, the cartilage is dissolved and replaced by primary bone marrow primarily as trabeculae.
Osteoblasts	Cells that synthetise the organic compounds of the bone ground substance (osteoid) like collagen (Typ-I), proteoglycanes and glycoproteins. After the completion of the bone formation (i.e., the inclusion of the osteoblasts within the intercelluar substance) the osteblasts become osteocytes.
Osteoclasts	These cells are responsible for the resorption of bone. Osteoclasts degrade bone by enzymes and phagocytose. A single osteoclast can destroy the amount of bone tissue that has been built up by 100-150 osteoblastes within the same time frame. Osteoclasts are big, polymorphonuclear giant cells with loose basophilic cytoplasma, lots of mitochondrions and scarce amount of ergastoplasma.

Osteoconduction	An implant causes by means of chemical and/or physical stimuli a directed growth of osteons in bone tissue, what results in generation of bone onto the surface of body own structures or of an implant.
Osteocytes	Osteocytes are mature bone cells that are derived from osteoblasts as these become surrounded by bone ground substance and stop their synthesis phase. Osteocytes are responsible for the maintenance of the bone matrix and the control of calcium and phosphate balance in the body. Osteocytes are connected to each other by means of fine, cytoplasmatic tails (philopodiae), that are located in the radial outgoing channels of the bone cavity. This enables the intercellular transport of ions and small molecules.
Osteogenesis	Substitution of chondral preformed skeletal parts by bone tissue. It is also the synthesis of new bone by osteoblasts and osteoblast precursor cells in a bone graft. Further, osteogenesis refers to bone generation initiated by surviving cells of a transplant. It starts from cells of the bone surface, osteoblasts and osteoprogenitor cells.
Osteoid	Ground substance of bone (uncalcified bone matrix).
Osteoinduction	An implant leads to bone formation in an atypical tissue. The ossification occurs by a substance released from the implant, what elicits proliferation and differentiation of mesenchymal osteoprogenitor cells to osteoblasts, and eventually cause bone formation.
Osteolysis	Dissolution of bone especially when associated with resorption.
Osteons	Smallest functional unit of bone; a haversian canal with the concentrically arranged laminae of bone that surround it.
Osteosynthesis	The operation of uniting the ends of bone fragments (e.g., after fracture, osteotomy, ...) by mechanical means (as a wire or metal plate).
Passivation	Spontaneous formation of a protective barrier that inhibits oxygen diffusion and corrosion.
Periosteum	Membrane formed by connective tissue containing vessels and nerves which envelopes bone except at the articular surfaces..
Phagocytosis	Active engulfing of avital or viable particles for the purpose of nutrition or of elimination of foreign bodies.
Photolithography	A process used in microfabrication to selectively remove parts of a thin film or the bulk of a substrate. It uses light to transfer a geometric pattern from a photo mask to a light-sensitive chemical "photoresist", or simply "resist," on the substrate. A series of chemical treatments then either engraves the exposure pattern into, or enables deposition of a new material in the desired pattern upon, the material underneath the photo resist.
Pinocytosis	The uptake of fluid and dissolved substances by a cell by invagination and pinching off of the cell membrane
Plasma sterilisation	Sterilisation method using very active molecules in the plasma discharge that permit, under specific conditions, a high-efficiency sterilisation at low temperature using small concentrations of active product (e.g. hydrogen peroxide, peracetic acid).
Plasticisers	Additives that increase the plasticity or fluidity of the material to which they are added; these include plastics, cement, concrete, wallboard, and clay.
Polymer	A large molecule (macromolecule) composed of repeating structural units. These subunits are typically connected by covalent chemical bonds. Although the term polymer is sometimes taken to refer to plastics, it actually encompasses a large class comprising both natural and synthetic materials with a wide variety of properties.

Powder pressing	Formation of a solid material by the compacting of fine particles under pressure.
Proliferation	Increase in cell number or tissue by normal cellular cleavage.
Prosthesis	A device that replaces a limb, organ or tissue of the body.
Pyrogen	A fever-producing substance (as various thermostable products of bacterial metabolism).
Radioluscent	Partly or wholly permeable to radiation and especially X-rays.
Radiopacity	The quality or state of being radiopaque, i.e., being opaque to radiation and especially X-rays.
Remodeling	Continuous process of bone restructuring: Osteoclasts deepen at the endosteal surface of bone cavities that are filled up again by osteoblasts. Bioactive osteoinductive implants are also subjected to the remodeling. Every restructuring of the bone due to a changing of the loading situation or his nutrition, and healing of bone fracture results from the interaction of osteoblasts and osteoclasts. Throughout life bone is formed and resorbed. Up to the age of 35 the formation processes prevail and the bone mass increases permanently. Beyond 35 the bone mass reduces usually by about 1.5% per year.
Restoration (dental)	The replacing of missing teeth or crowns.
Retainer (dental)	A dental appliance used to hold teeth in their correct position especially following orthodontic treatment.
Rolling	Thinning of a metal sheet by pressing it.
Scanning electron microscopy	Microscope that focuses at high-energy beam of electrons at the source and collects the back-scattered beam of these electrons (acronym SEM).
Shape memory alloy (polymer)	Alloy or polymer showing no change in shape when the load is removed but that does return to its initial lattice position when heated (or subjected to an electric current).
Silicones	Polymers that include silicon together with carbon, hydrogen, oxygen, and sometimes other chemical elements. Some common forms include silicone oil, silicone grease, silicone rubber, and silicone resin. Not to be confused with the metalloid chemical element *Silicon*.
Silk	A natural protein fibre obtained from the cocoons of the larvae of the mulberry silkworm.
Sintering	Process by which a solid is formed from particle by heating until individual particles stick together.
Stabilisers (polymer)	Chemical compounds used directly or by combinations to prevent the various effects such as oxidation, chain scission and uncontrolled recombinations and cross-linking reactions in polymers that are caused by the action of heat, UV-light, chemicals and/or oxygen.
Stenosis	A narrowing or constriction of the diameter of a bodily passage or orifice (aortic stenosis, mitral stenosis, pulmonary stenosis, spinal stenosis, subaortic stenosis, oesophageal stenosis, ...).
Stent	A short narrow metal or plastic tube often in the form of a mesh that is inserted into the lumen of an anatomical vessel (as an artery or bile duct) especially to keep a previously blocked passageway open.
Sterilant	An agent that destroys all viable forms of microbial life to achieve sterilisation.
Sterilisation (microbiology)	Chemical or physical method implying inactivation of all viable forms of life or reproduction at a selected probability (e.g., less than 10^{-6} microbial survivor probability).
Sterility (microbiology)	Absence of all viable micro-organisms including their resistant dormant bodies and spores.

Strain hardening	See cold working
Stress corrosion cracking	The unexpected sudden failure of normally ductile metals subjected to a tensile stress in a corrosive environment, especially at elevated temperature in the case of metals.
Stress shielding effect	Reduction in bone mass as the result of removal of normal stress from the bone by an implant.
Structure compatibility	Adaptation of the implant structure on the mechanical behaviour of the recipient tissue. This covers both the shape (design) and the inner structure (e.g., the orientation of fibres).
Subperiostal implant	Implant situated or occurring beneath the periosteum.
Surface compatibility	Adaptation of the chemical, physical, biological and morphological surface properties of the implant to that of the recipient tissue in order to obtain clinically intended interactions.
Supraconstruction	Visible part of a dental prosthesis that is mounted on the implant abutment, and that mimics the natural tooth.
Suture	A strand or fibre used to sew parts of the living body. Further, the line of union in an immovable articulation (as between the bones of the skull).
Tendon	A tough cord or band of dense white fibrous connective tissue that unites a muscle with some other part, transmits the force which the muscle exerts, and is continuous with the connective-tissue epimysium and perimysium of the muscle and when inserted into a bone with the periosteum of the bone.
Thermoplastics	Polymers with a low softening point (in comparison to most of the metals) due to the lack of covalent bonding between chains. Such polymers can be re-melted and re-formed several times before a noticeable weakening in properties occurs.
Thermosets	Polymers that can not be repeatedly melted and re-formed because of strong covalent bonding between the chains.
Thrombocytes	Blood platelets derived from megakaryocytes in the bone marrow. They are disc-shaped corpuscular blood components without nucleus with a diameter of 2 to 3.5 µm and a thickness of from 0.5 to 0.75 µm. They are surrounded by a cell membrane derived from the endoplasmic reticulum of the megakaryocytes.
Thrombogenicity	Quality of tending to produce a thrombus, i.e. a clot of blood formed within a blood vessel and remaining attached to its place of origin.
Thrombosis	Blood clotting.
Tissue	An aggregate of cells usually of a particular kind together with their intercellular substance and fluids that form one of the structural materials of a plant or an animal and that in animals include connective tissue, epithelium, muscle tissue, and nerve tissue
Tissue Engineering	An interdisciplinary research field that applies the principles of natural sciences and engineering to develop artificial tissue or tissue-replacement systems to support or replace malfunctioning tissues or organs. It is a new development in biotechnology with the aim to regenerate the body's own tissues by combining appropriate signal molecules (mediators) with a matrix. The additional combination with tissue-producing cells that are obtained from small biopsies enables the manufacturing of living structures as a tissue replacement.
Toughness	Resistance to fracture of a material when stressed. It represents to the amount of energy per volume that a material can absorb before rupturing ($J.m^{-3}$) and corresponds to the integral underneath the stress-strain curve.
Transosseous implant	Dental implant that is fixed through the mandible.

Transplantation	An act, process, or instance of transplanting living tissue; *especially*: the removal of tissue from one part of the body or from one individual and its implantation or insertion in another especially by surgery.
Tribology	The science and engineering of interacting surfaces in relative motion. It includes the study and application of the principles of friction, lubrication and wear. Tribology is a branch of mechanical engineering.
UHMWPE	Ultrahigh molecular weight polyethylene (or PE-UHMW) is a PE with an extreme high molar mass, that has significant different properties from conventional PE. It is broadly used in joint prosthesis systems.
Ultimate strength	Is the maximum stress that a material can withstand while being stretched or pulled before necking, which is when the specimen's cross-section starts to significantly contract.
Veneers	A polymeric or porcelain coating bonded to the surface of a cosmetically imperfect tooth.
Visco-elastic	Materials for which the relationship stress and strain depends on time.
Vulcanisation	A chemical process for converting rubber or related polymers into more durable materials via the addition of sulphur or other equivalent "curatives." These additives modify the polymer by forming crosslinks (bridges) between individual polymer chains.
Wear	Erosion or sideways displacement of material from its "derivative" and original position on a solid surface performed by the action of another surface.
Work hardening	Is the strengthening of a metal by plastic deformation. This strengthening occurs because of dislocation movements within the crystal structure of the material. See also: strain hardening or cold working.
Wrought alloys	Alloys that are shaped by plastic deformation (in contrast to cast alloys).
Xenogeneic	(Former: heterologous), derived from, originating in, or being a member of another species.
Yield strength	Is defined in engineering and materials science as the stress at which a material begins to deform plastically.
Zirconia	Ceramic material composed of white crystalline oxide of zirconium (ZrO_2).

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