CRYSTALLINE STATE. pdf

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Crystalline state. Crystalline state "A crystal is a solid composed of atoms (ions or molecules) arranged in an orderly repetitive array". Most of the naturally occurring solids are found to have definite crystalline shapes which can be recognized easily.

Crystalline versus Amorphous Solids. Crystal Structure versus Crystal Morphology This report application, the market has been segmented into food packaging, beverage packaging, and others. PowerPoint PPT presentation free to view How many net atoms are there per unit cell? What is the percentage void PowerPoint PPT presentation free to download laser illumination causes the elastomer to bend towards the beam, as shown. Arial Times New Roman Default At Cape Crystal Brands, you can be rest assured that the product goes through legitimate tests to ensure that the final product received by you is worthwhile and also tastes good, but while the product may be good, it is also important that the users know the set of product and the content of the same too. PowerPoint Presentation Last modified by: Lenovo User Created Date: The report provides key statistics on the market status of the Crystalline Series Solar Battery manufacturers and is a valuable source of guidance and direction for companies and individuals interested in the industry. PowerPoint PPT presentation free to download In solid state, particles are bonded together in rigid, crystalline structure. PowerPoint PPT presentation free to download Non-crystalline materials and other things By the end of this section you should: PowerPoint PPT presentation free to download Levitation experiment works well. The report provides key statistics on the market status of the Automatic Crystalline Solar Cells Laser Equipment manufacturers and is a valuable source of guidance and direction for companies and individuals interested in the industry. Soft and malleable metals usually have ccp structure copper PowerPoint PPT presentation free to download Objectives To learn about the types of crystalline solids To understand the interparticle forces in crystalline solids To learn how the bonding in metals determines Distorted TiO6 octahedra forming columns by sharing edges PowerPoint PPT presentation free to download a series of anti-Stokes shifted peaks still lower intensity, shorter wavelength Use the examples linked to the table to see the profile and intensity of bands. Dispersion laws for rd gu and rs bu LOFF phase is gapless Strong research and development capabilities have enabled development of advanced process technologies and manufacturing economies. The company seeks to operate cost-effectively and on a large scale. What is the radius of a carbon atom? Effects of X-irradiation on single crystals of myoglobin. Department of Energy laboratory managed by The University of Chicago IIT, 19 July DD analysis of the Mg 2B mixture after 3-min mechanical activation with Karl Pallmeyer Last modified by: Zachary Romer Created Date:

2: Crystalline state

A crystal or crystalline solid is a solid material whose constituents (such as atoms, molecules, or ions) are arranged in a highly ordered microscopic structure, forming a crystal lattice that extends in all directions.

This page is all about polymer crystals. No, this page has nothing to do with polymers as used by the new age community. Ice is a crystal. In ice all the water molecules are arranged in a specific manner. So is table salt, sodium chloride. To understand all this talk of crystals and amorphous solids, it helps to go home. You see, some people are very neat and orderly. When they put their socks away they fold them and stack them very neatly. Such folk will just throw their socks in the drawer in one big tangled mess. Their sock drawers look like this: Polymers are just like socks in that sometimes they are arranged in a neat orderly manner, like the sock drawer in the top picture. When this is the case, we say the polymer is crystalline. Other times there is no order, and the polymer chains just form a big tangled mess, like the socks in the bottom picture. When this happens, we say the polymer is amorphous. So what kind of arrangements do the polymers like to form? They like to line up all stretched out, kind of like a neat pile of new boards down at the lumber yard. In fact, very few polymers can stretch out perfectly straight, and those are ultra-high molecular weight polyethylene , and aramids like Kevlar and Nomex. Most polymers can only stretch out for a short distance before they fold back on themselves. You can see this in the picture. For polyethylene , the length the chains will stretch before they fold is about angstroms. But not only do polymers fold like this. Polymers also form stacks of these folded chains. There is a picture of a stack, called a lamella, right below. When this happens we get the kind of mess you see below. Our lamella is no longer neat and tidy, but sloppy, with chains hanging out of it everywhere! Of course, being indecisive, the polymer chains will often decide they want to come back into the lamella after wandering around outside for awhile. When this happens, we get a picture like this: This is the switchboard model of a polymer crystalline lamella. Amorphousness and Crystallinity Are you wondering about something? If you look at those pictures up there, you can see that some of the polymer is crystalline, and some is not! Yes folks, most crystalline polymers are not entirely crystalline. We fancy bigshot scientists say that they are in the amorphous state. So a crystalline polymer really has two components: The crystalline portion is in the lamellae, and the amorphous potion is outside the lamellae. If we look at a wide-angle picture of what a lamella looks like, we can see how the crystalline and amorphous portions are arranged. As you can see, lamella grow like the spokes of a bicycle wheel from a central nucleus. Sometimes we bigshot scientists like to call these spokes "lamellar fibrils". The fibrils grow out in three dimensions, so they really look more like spheres than wheels. The whole assembly is called a spherulite. In a sample of a crystalline polymer weighing only a few grams, there are many billions of spherulites. In between the crystalline lamellae, there are regions where there is no order to the arrangement of the polymer chains. These disordered regions are the amorphous regions we were talking about. As you can also see in the picture, a single polymer chain may be partly in a crystalline lamella, and partly in the amorphous state. Some chains even start in one lamella, cross the amorphous region, and then join another lamella. These chains are called tie molecules. So you see, no polymer is completely crystalline. Crystallinity makes a material strong, but it also makes it brittle. A completely crystalline polymer would be too brittle to be used as plastic. The amorphous regions give a polymer toughness, that is, the ability to bend without breaking. But for making fibers, we like our polymers to be as crystalline as possible. This is because a fiber is really a long crystal. Want to know more? Then visit the Fiber Page! Many polymers are a mix of amorphous and crystalline regions, but some are highly crystalline and some are highly amorphous. Here are some of the polymers that tend toward the extremes: Some Highly Crystalline Polymers:

3: Elect Crystal Bailey For State Senate District 11

Minerals and the crystalline state. This free course is available to start right now. Review the full course description and key learning outcomes and create an account and enrol if you want a free statement of participation.

The definition of a solid appears obvious; a solid is generally thought of as being hard and firm. Upon inspection, however, the definition becomes less straightforward. A cube of butter, for example, is hard after being stored in a refrigerator and is clearly a solid. After remaining on theâ€¦ Solids exhibit certain characteristics that distinguish them from liquids and gases. All solids have, for example, the ability to resist forces applied either perpendicular or parallel to a surface i. Such properties depend on the properties of the atoms that form the solid, on the way those atoms are arranged, and on the forces between them. Solids are generally divided into three broad classesâ€”crystalline, noncrystalline amorphous , and quasicrystalline. Crystalline solids have a very high degree of order in a periodic atomic arrangement. Practically all metals and many other minerals, such as common table salt sodium chloride , belong to this class. Noncrystalline solids are those in which atoms and molecules are not organized in a definite lattice pattern. They include glasses, plastics, and gels. Quasicrystalline solids display novel symmetries in which the atoms are arranged in quasiperiodic fashionâ€”i. They exhibit symmetries, such as fivefold symmetry , that are forbidden in ordinary crystals. Quasicrystal structures are common in alloys in which aluminum is combined with another metal , such as iron , cobalt, or nickel. Some molecules may exist in the liquid crystal state, which is intermediate to the crystalline solid and liquid states. Liquid crystals flow like liquids yet display a certain degree of the symmetry characteristic of crystalline solids. Four principal types of atomic bonds are found in crystalline solids: Metals and their alloys are characterized in the main by their high electrical and thermal conductivity , which arise from the migration of free electrons; free electrons also influence how the atoms bond. Ionic crystals are aggregates of charged ions. These salts commonly exhibit ionic conductivity, which increases with temperature. Covalent crystals are hard, frequently brittle materials such as diamond , silicon , and silicon carbide. In the simpler, monatomic types e. Molecular crystals are substances that have relatively weak intermolecular binding, such as Dry Ice solidified carbon dioxide , solid forms of the rare gases e. Various alloys, salts, covalent crystals, and molecular crystals that are good electrical insulators at low temperature become conductors at elevated temperatures, conductivity increasing rapidly with temperature. Materials of this type are called semiconductors. Their electrical conductivity is generally low when compared with that of such metals as copper, silver, or aluminum see semiconductor. Learn More in these related Britannica articles:

4: Solid State Chemistry: Describing Crystalline Solids

The term crystalline is applicable to all solid materials that exhibit an internal, ordered arrangement of the constituent atoms (or ions) forming a repetitive three-dimensional pattern.

Crystal structure microscopic Halite table salt, NaCl: Microscopic and macroscopic Microscopic structure of a halite crystal. Purple is sodium ion, green is chlorine ion. Crystal structure The scientific definition of a "crystal" is based on the microscopic arrangement of atoms inside it, called the crystal structure. A crystal is a solid where the atoms form a periodic arrangement. Quasicrystals are an exception, see below. Not all solids are crystals. For example, when liquid water starts freezing, the phase change begins with small ice crystals that grow until they fuse, forming a polycrystalline structure. In the final block of ice, each of the small crystals called " crystallites " or "grains" is a true crystal with a periodic arrangement of atoms, but the whole polycrystal does not have a periodic arrangement of atoms, because the periodic pattern is broken at the grain boundaries. Most macroscopic inorganic solids are polycrystalline, including almost all metals , ceramics , ice , rocks , etc. Solids that are neither crystalline nor polycrystalline, such as glass , are called amorphous solids , also called glassy , vitreous, or noncrystalline. These have no periodic order, even microscopically. There are distinct differences between crystalline solids and amorphous solids: A crystal structure an arrangement of atoms in a crystal is characterized by its unit cell, a small imaginary box containing one or more atoms in a specific spatial arrangement. The unit cells are stacked in three-dimensional space to form the crystal. The symmetry of a crystal is constrained by the requirement that the unit cells stack perfectly with no gaps. There are possible crystal symmetries, called crystallographic space groups. These are grouped into 7 crystal systems , such as cubic crystal system where the crystals may form cubes or rectangular boxes, such as halite shown at right or hexagonal crystal system where the crystals may form hexagons, such as ordinary water ice. Crystal faces and shapes As a halite crystal is growing, new atoms can very easily attach to the parts of the surface with rough atomic-scale structure and many dangling bonds. Therefore, these parts of the crystal grow out very quickly yellow arrows. Eventually, the whole surface consists of smooth, stable faces, where new atoms cannot as easily attach themselves. Crystals are commonly recognized by their shape, consisting of flat faces with sharp angles. These shape characteristics are not necessary for a crystalâ€”a crystal is scientifically defined by its microscopic atomic arrangement, not its macroscopic shapeâ€”but the characteristic macroscopic shape is often present and easy to see. Euhedral crystals are those with obvious, well-formed flat faces. Anhedral crystals do not, usually because the crystal is one grain in a polycrystalline solid. The flat faces also called facets of a euhedral crystal are oriented in a specific way relative to the underlying atomic arrangement of the crystal: As a crystal grows, new atoms attach easily to the rougher and less stable parts of the surface, but less easily to the flat, stable surfaces. Therefore, the flat surfaces tend to grow larger and smoother, until the whole crystal surface consists of these plane surfaces. See diagram on right. One of the oldest techniques in the science of crystallography consists of measuring the three-dimensional orientations of the faces of a crystal, and using them to infer the underlying crystal symmetry. This is determined by the crystal structure which restricts the possible facet orientations , the specific crystal chemistry and bonding which may favor some facet types over others , and the conditions under which the crystal formed. Occurrence in nature Fossil shell with calcite crystals Rocks By volume and weight, the largest concentrations of crystals in the Earth are part of its solid bedrock. Crystals found in rocks typically range in size from a fraction of a millimetre to several centimetres across, although exceptionally large crystals are occasionally found. The vast majority of igneous rocks are formed from molten magma and the degree of crystallization depends primarily on the conditions under which they solidified. Such rocks as granite , which have cooled very slowly and under great pressures, have completely crystallized; but many kinds of lava were poured out at the surface and cooled very rapidly, and in this latter group a small amount of amorphous or glassy matter is common. Other crystalline rocks, the metamorphic rocks such as marbles , mica-schists and quartzites , are recrystallized. This means that they were at first fragmental rocks like limestone , shale and sandstone and have never been in a molten condition nor entirely in solution, but the high temperature and pressure conditions of metamorphism have acted on them by erasing their original structures and inducing recrystallization in the solid state. The evaporites such as halite , gypsum and some limestones have been deposited from aqueous solution, mostly owing to evaporation in arid climates. Ice Water-based ice in the form of snow , sea ice and glaciers is a very common manifestation of crystalline or polycrystalline matter on Earth. Organigenic crystals Many living organisms are able to produce crystals, for example calcite and aragonite in the case of most molluscs or hydroxylapatite in the case of vertebrates. Polymorphism and allotropy Main articles: Polymorphism materials science and Allotropy The same group of atoms can often solidify in many different ways. Polymorphism is the ability of a solid to exist in more than one crystal form. For example, water ice is ordinarily found in the hexagonal form Ice Ih , but can also exist as the cubic Ice Ic , the rhombohedral ice II , and many other forms. The different polymorphs are usually called different phases. In addition, the same atoms may be able to form noncrystalline phases. For example, water can also form amorphous ice , while SiO2 can form both fused silica an amorphous glass and quartz a crystal. Likewise, if a substance can form crystals, it can also form polycrystals. For pure chemical elements, polymorphism is known as allotropy. For example, diamond and graphite are two crystalline forms of carbon , while amorphous carbon is a noncrystalline form. Polymorphs, despite having the same atoms, may have wildly different properties. For example, diamond is among the hardest substances known, while graphite is so soft that it is used as a lubricant. Polyamorphism is a similar phenomenon where the same atoms can exist in more than one amorphous solid form. Crystallization and Crystal growth Vertical cooling crystallizer in a beet sugar factory. Crystallization is the process of forming a crystalline structure from a fluid or from materials dissolved in a fluid. More rarely, crystals may be deposited directly from gas; see thin-film deposition and epitaxy. Crystallization is a complex and extensively-studied field, because depending on the conditions, a single fluid can solidify into many different possible forms. It can form a single crystal , perhaps with various possible phases , stoichiometries , impurities, defects , and habits. Or, it can form a polycrystal , with various possibilities for the size, arrangement, orientation, and phase of its grains. The final form of the solid is determined by the conditions under which the fluid is being solidified, such as the chemistry of the fluid, the ambient pressure , the temperature , and the speed with which all these parameters are changing. Specific industrial techniques to produce large single crystals called boules include the Czochralski process and the Bridgman technique. Other less exotic methods of crystallization may be used, depending on the physical properties of the substance, including hydrothermal synthesis , sublimation , or simply solvent-based crystallization. Large single crystals can be created by geological processes. For example, selenite crystals in excess of 10 meters are found in the Cave of the Crystals in Naica, Mexico. Crystals can also be formed by biological processes, see above. Conversely, some organisms have special techniques to prevent crystallization from occurring, such as antifreeze proteins. Defects, impurities, and twinning Main articles: Crystallographic defect , Impurity , Crystal twinning , and Mosaicity Two types of crystallographic defects. An ideal crystal has every atom in a perfect, exactly repeating pattern. The types and structures of these defects may have a profound effect on the properties of the materials. A few examples of crystallographic defects include vacancy defects an empty space where an atom should fit , interstitial defects an extra atom squeezed in where it does not fit , and dislocations see figure at right. Dislocations are especially important in materials science , because they help determine the mechanical strength of materials. Another common type of crystallographic defect is an impurity , meaning that the "wrong" type of atom is present in a crystal. For example, a perfect crystal of diamond would only contain carbon atoms, but a real crystal might perhaps contain a few boron atoms as well. Likewise, the only difference between ruby and sapphire is the type of impurities present in a corundum crystal. Twinned pyrite crystal group. Semiconductor devices , such as transistors , are made possible largely by putting different semiconductor dopants into different places, in specific patterns. Twinning is a phenomenon somewhere between a crystallographic defect and a grain boundary. Like a grain boundary, a twin boundary has different crystal orientations on its two sides. But unlike a grain boundary, the orientations are not random, but related in a specific, mirror-image way. Mosaicity is a spread of crystal plane orientations. A mosaic crystal is supposed to consist of smaller crystalline units that are somewhat misaligned with respect to each other. Chemical bonds In general, solids can be held together by various types of chemical bonds , such as metallic bonds , ionic bonds , covalent bonds , van der Waals bonds , and others. None of these are necessarily crystalline or non-crystalline. However, there are some general trends as follows. Metals are almost always polycrystalline, though there are exceptions like amorphous metal and single-crystal metals. The latter are grown synthetically. A microscopically-small piece of metal may naturally form into a single crystal, but larger pieces generally do not. Ionic compound materials are usually crystalline or polycrystalline. In practice, large salt crystals can be created by solidification of a molten fluid, or by crystallization out of a solution. Covalently bonded solids sometimes called covalent network solids are also very common, notable examples being diamond and quartz. Weak van der Waals forces also help hold together certain crystals, such as crystalline molecular solids , as well as the interlayer bonding in graphite. Polymer materials generally will form crystalline regions, but the lengths of the molecules usually prevent complete crystallizationâ€”and sometimes polymers are completely amorphous. Quasicrystals The material holmiumâ€"magnesiumâ€"zinc Hoâ€"Mgâ€"Zn forms quasicrystals , which can take on the macroscopic shape of a dodecahedron. Only a quasicrystal, not a normal crystal, can take this shape. Quasicrystal A quasicrystal consists of arrays of atoms that are ordered but not strictly periodic. They have many attributes in common with ordinary crystals, such as displaying a discrete pattern in x-ray diffraction , and the ability to form shapes with smooth, flat faces. Quasicrystals are most famous for their ability to show five-fold symmetry, which is impossible for an ordinary periodic crystal see crystallographic restriction theorem. The International Union of Crystallography has redefined the term "crystal" to include both ordinary periodic crystals and quasicrystals "any solid having an essentially discrete diffraction diagram" [15].

5: Crystallinity in Polymers

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6: Paracrystalline - Wikipedia

Rocks are made of minerals and, as minerals are natural crystals, the geological world is mostly a crystalline world. This free course, Minerals and the crystalline state, introduces the study of minerals and crystal structures, using online text and interactive activities, including questions and answers, video clips, slidecasts and a Digital Kit.

7: Solid | state of matter | www.enganchecubano.com

Although there are only 7 crystal systems or shapes, there are 14 different crystal lattices, called Bravais Lattices. (3 different cubic types, 2 different tetragonal types, 4 different orthorhombic types, 2 different monoclinic types, 1 rhombohedral, 1 hexagonal, 1 triclinic).

8: Home - Crystal Mountain Resort WACrystal Mountain Resort WA

ionic as solids, but is suggestive of ions in the solid state. Their high melting points are also suggestive of ionic structures, and the molten salts also conduct electricity.

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