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Chapter 1 : Food Fats and Oils

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Media can only be downloaded from the desktop version of this website. Share Leave a comment For the first time, MIT physicists have observed a highly ordered crystal of electrons in a semiconducting material and documented its melting, much like ice thawing into water. The observations confirm a fundamental phase transition in quantum mechanics that was theoretically proposed more than 80 years ago but not experimentally documented until now. The method uses hundreds of thousands of short electrical pulses to probe a sheet of electrons in a semiconducting material cooled to extremely low temperatures, just above absolute zero. With their tunneling technique, the researchers shot electrons into the supercooled material to measure the energy states of electrons within the semiconducting sheet. Against a background blur, they detected a sharp spike in the data. After much analysis, they determined that the spike was the precise signal that would be given off from a highly ordered crystal of electrons vibrating in unison. As the group increased the density of electrons, essentially packing them into ever tighter quarters within the sheet, they found the data spike shot up to higher energies, then disappeared entirely, precisely at an electron density at which an electronic crystal has been predicted to melt. The researchers believe they have finally captured the process of quantum melting â€" a phase transition in quantum mechanics, in which electrons that have formed a crystalline structure purely through their quantum interactions melt into a more disordered fluid, in response to quantum fluctuations to their density. A crystallizing idea The idea for a crystal of electrons was first proposed in by the Hungarian-American physicist Eugene Wigner. Normally, semiconducting metals such as silicon and aluminum are able to conduct electricity in the form of electrons that ping-pong around at lighning speeds, creating a current through the material. Any movements electrons do exhibit, then, should be due to quantum interactions â€" the invisible forces between individual electrons and other quantum, subatomic particles. Electrons, being negatively charged, naturally repel each other. Wigner proposed that for supercooled electrons at low densities, their mutual repulsive forces should act as a sort of scaffold, holding the electrons together yet apart at equally spaced intervals, thus creating a crystal of electrons. Such a rigid arrangement, which has since been coined a Wigner crystal, should turn a metal into an insulator rather than an electrical conductor. For their part, Ashoori and Jang did not originally set out to find a Wigner crystal, but instead simply wanted to probe a two-dimensional sheet of electrons using their electron tunneling technique. For the past decade, the group has developed and improved upon its technique, which involves shooting electrons through a barrier to probe the energy states of a material on the other side. There, the tunneling electrons can cause vibrations in the surrounding electrons, the energies of which researchers can measure, given the known energies of the tunneling electrons. The researchers cooled the entire sample down to just a fraction above absolute zero and applied pulses of electrons at varying energies, then analyzed the resulting data. When Jang noticed the very sharp spike in the data, he looked through previous theoretical literature to explain the feature and eventually came to the conclusion that the spike, given the temperature and electron density at which it formed, could only be a signature for a crystal of electrons vibrating in unison. The crystal of electrons, the researchers surmised, must have become so dense that the entire structure crumbled into a more disordered, fluid state.

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Chapter 2 : Vanadium(3+) | V | ChemSpider

Here is a melting point test video performed with a Stuart SMP40 Melting Point Device. The substance being tested is 3-Meo-PCMO The results are listed below.

Conceptual Answers Crystalline solids have regular ordered arrays of components held together by uniform intermolecular forces, whereas the components of amorphous solids are not arranged in regular arrays. The learning objective of this module is to know the characteristic properties of crystalline and amorphous solids. Introduction With few exceptions, the particles that compose a solid material, whether ionic, molecular, covalent, or metallic, are held in place by strong attractive forces between them. When we discuss solids, therefore, we consider the positions of the atoms, molecules, or ions, which are essentially fixed in space, rather than their motions which are more important in liquids and gases. The constituents of a solid can be arranged in two general ways: The faces of crystals can intersect at right angles, as in galena PbS and pyrite FeS2 , or at other angles, as in quartz. Right Cleavage surfaces of an amorphous solid. Obsidian, a volcanic glass with the same chemical composition as granite typically KAlSi3O8 , tends to have curved, irregular surfaces when cleaved. Crystalline solids, or crystals, have distinctive internal structures that in turn lead to distinctive flat surfaces, or faces. The faces intersect at angles that are characteristic of the substance. When exposed to x-rays, each structure also produces a distinctive pattern that can be used to identify the material. The characteristic angles do not depend on the size of the crystal; they reflect the regular repeating arrangement of the component atoms, molecules, or ions in space. When an ionic crystal is cleaved Figure In a covalent solid such as a cut diamond, the angles at which the faces meet are also not arbitrary but are determined by the arrangement of the carbon atoms in the crystal. Deformation of the ionic crystal causes one plane of atoms to slide along another. The resulting repulsive interactions between ions with like charges cause the layers to separate. Crystals tend to have relatively sharp, well-defined melting points because all the component atoms, molecules, or ions are the same distance from the same number and type of neighbors; that is, the regularity of the crystalline lattice creates local environments that are the same. Thus the intermolecular forces holding the solid together are uniform, and the same amount of thermal energy is needed to break every interaction simultaneously. Amorphous solids have two characteristic properties. When cleaved or broken, they produce fragments with irregular, often curved surfaces; and they have poorly defined patterns when exposed to x-rays because their components are not arranged in a regular array. An amorphous, translucent solid is called a glass. Almost any substance can solidify in amorphous form if the liquid phase is cooled rapidly enough. Some solids, however, are intrinsically amorphous, because either their components cannot fit together well enough to form a stable crystalline lattice or they contain impurities that disrupt the lattice. For example, although the chemical composition and the basic structural units of a quartz crystal and quartz glass are the sameâ€"both are SiO2 and both consist of linked SiO4 tetrahedraâ€"the arrangements of the atoms in space are not. Crystalline quartz contains a highly ordered arrangement of silicon and oxygen atoms, but in quartz glass the atoms are arranged almost randomly. In contrast, aluminum crystallizes much more rapidly. The lattice of crystalline quartz SiO2. The atoms form a regular arrangement in a structure that consists of linked tetrahedra. In an amorphous solid, the local environment, including both the distances to neighboring units and the numbers of neighbors, varies throughout the material. Different amounts of thermal energy are needed to overcome these different interactions. Consequently, amorphous solids tend to soften slowly over a wide temperature range rather than having a well-defined melting point like a crystalline solid. If an amorphous solid is maintained at a temperature just below its melting point for long periods of time, the component molecules, atoms, or ions can gradually rearrange into a more highly ordered crystalline form. Crystals have sharp, well-defined melting points; amorphous solids do not. Summary Solids are characterized by an extended three-dimensional arrangement of atoms, ions, or molecules in which the components are generally locked into their positions. The components can be arranged in a regular repeating three-dimensional array a crystal lattice , which results in a crystalline solid, or more or less randomly to produce an amorphous solid. Crystalline solids have well-defined edges and faces, diffract x-rays, and tend to have sharp melting points. In contrast, amorphous solids have irregular or curved surfaces, do not give well-resolved x-ray diffraction patterns, and melt over a wide range of temperatures. Compare the solid and liquid states in terms of a. How do amorphous solids differ from crystalline solids in each characteristic? Which of the two types of solid is most similar to a liquid? Why is the arrangement of the constituent atoms or molecules more important in determining the properties of a solid than a liquid or a gas? Why are the structures of solids usually described in terms of the positions of the constituent atoms rather than their motion? What physical characteristics distinguish a crystalline solid from an amorphous solid? Describe at least two ways to determine experimentally whether a material is crystalline or amorphous. Explain why each characteristic would or would not favor the formation of an amorphous solid. A student obtained a solid product in a laboratory synthesis. After it had cooled, she measured the melting point of the same sample again and found that this time the solid had a sharp melting point at the temperature that is characteristic of the desired product. Why were the two melting points different? What was responsible for the change in the melting point? The arrangement of the atoms or molecules is more important in determining the properties of a solid because of the greater persistent long-range order of solids. Gases and liquids cannot readily be described by the spatial arrangement of their components because rapid molecular motion and rearrangement defines many of the properties of liquids and gases. The initial solid contained the desired compound in an amorphous state, as indicated by the wide temperature range over which melting occurred. Slow cooling of the liquid caused it to crystallize, as evidenced by the sharp second melting point observed at the expected temperature.

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Chapter 3 : Chemical racedaydvl.com - Vanadium (V)

Show transcribed image text 3. A crystal of gold is cooled from its melting point to a temperature of Â°C. Calculate the ratio of the number of vacancies to the number of divacancies in the crystal at Â°C, assuming complete equilibrium is maintained.

Structure[edit] Fe2O3 can be obtained in various polymorphs. That is, each Fe center is bound to six oxygen ligands. It occurs naturally as the mineral hematite which is mined as the main ore of iron. Its magnetic properties are dependent on many factors, e. It is metastable and converted from the alpha phase at high temperatures. It occurs naturally as the mineral maghemite. It is ferromagnetic and finds application in recording tapes, [10] although ultrafine particles smaller than 10 nanometers are superparamagnetic. It can be prepared by thermal dehydratation of gamma iron III oxide-hydroxide. Other phases[edit] Several other phases have been identified or claimed. It can be prepared by reduction of hematite by carbon, pyrolysis of iron III chloride solution, or thermal decomposition of iron III sulfate. The epsilon phase is rhombic, and shows properties intermediate between alpha and gamma, and may have useful magnetic properties. Preparation of the pure epsilon phase has proven very challenging due to contamination with alpha and gamma phases. Material with a high proportion of epsilon phase can be prepared by thermal transformation of the gamma phase. Can also be prepared by oxidation of iron in an electric arc or by sol-gel precipitation from iron III nitrate. When alkali is added to solutions of soluble Fe III salts, a red-brown gelatinous precipitate forms. Several forms of the hydrated oxide of Fe III exist as well. Thermite is also used in weapons and making small-scale cast-iron sculptures and tools. It also dissolves well in solutions of chelating agents such as EDTA and oxalic acid. Heating iron III oxides with other metal oxides or carbonates yields materials known as ferrates: It can be prepared in the laboratory by electrolyzing a solution of sodium bicarbonate , an inert electrolyte, with an iron anode: It is used to put the final polish on metallic jewelry and lenses , and historically as a cosmetic. Rouge cuts more slowly than some modern polishes, such as cerium IV oxide , but is still used in optics fabrication and by jewelers for the superior finish it can produce. When polishing gold, the rouge slightly stains the gold, which contributes to the appearance of the finished piece. Rouge is sold as a powder, paste, laced on polishing cloths, or solid bar with a wax or grease binder. Other polishing compounds are also often called "rouge", even when they do not contain iron oxide. Jewelers remove the residual rouge on jewelry by use of ultrasonic cleaning. Products sold as " stropping compound" are often applied to a leather strop to assist in getting a razor edge on knives, straight razors, or any other edged tool. Iron oxides are used as pigments in dental composites alongside titanium oxides. Magnetic recording[edit] Iron III oxide was the most common magnetic particle used in all types of magnetic storage and recording media, including magnetic disks for data storage and magnetic tape used in audio and video recording as well as data storage. Its use in computer disks was superseded by cobalt alloy, enabling thinner magnetic films with higher storage density.

Chapter 4 : Scientists detect a quantum crystal of electrons and â€œwatchâ€• it melt | MIT News

Crystal Rainbow Pyramid Under The Stars. Crystal Rainbow Pyramid Under The Stars. Skip navigation Acid Mothers Temple & The Melting Paraiso U.F.O. - Pink Lady Lemonade Part 1 - Duration:

Degree of Unsaturation of Fats and Oils Food fats and oils are made up of triglyceride molecules which may contain both saturated and unsaturated fatty acids. The fatty acids that combine to make up triglycerides will vary; therefore, triglycerides can contain all saturated fatty acids, all unsaturated fatty acids or a mixture of both saturated and unsaturated fatty acids. Depending on the type of fatty acids combined in the molecule, triglycerides can be classified as mono- or di-, -saturated alternatively mono- or di- unsaturated , tri-saturated and tri-unsaturated as illustrated in Figure 3. Figure 3 Diagrams of Mono-, Di-, Trisaturated and Triunsaturated Triglycerides Generally speaking, fats that are liquid at room temperature tend to be more unsaturated than those that appear to be solid, but there are exceptions. For example, coconut oil has a high level of saturates, but many are of low molecular weight, hence this oil melts at or near room temperature. Thus, the physical state of the fat does not necessarily indicate the amount of unsaturation. The degree of unsaturation of a fat, i. IV is the number of grams of iodine which will react with the double bonds in grams of fat and may be calculated from the fatty acid composition. The typical IV for soybean oil is , for cottonseed oil , and for butterfat it is Length of Carbon Chains in Fatty Acids The melting properties of triglycerides are related to those of their fatty acids. As the chain length of a saturated fatty acid increases, the melting point also increases Table II. Thus, a short chain saturated fatty acid such as butyric acid has a lower melting point than saturated fatty acids with longer chains. Isomeric Forms of Fatty Acids For a given fatty acid chain length, saturated fatty acids will have higher melting points than those that are unsaturated. The melting points of unsaturated fatty acids are profoundly affected by the position and conformation of double bonds. For example, the monounsaturated fatty acid oleic acid and its geometric isomer elaidic acid have different melting points Table III. Oleic acid is liquid at temperatures considerably below room temperature, whereas elaidic acid is solid even at temperatures above room temperature. Molecular Configuration of Triglycerides The molecular configuration of triglycerides can also affect the properties of fats. Melting points vary in sharpness depending on the number of different chemical entities present. Simple triglycerides have sharp melting points while triglyceride mixtures like lard and most vegetable shortenings have broad melting ranges. In cocoa butter, palmitic P , stearic S , and oleic O acids are combined in two predominant triglyceride forms POS and SOS , giving cocoa butter its sharp melting point just slightly below body temperature. This melting pattern partially accounts for the pleasant eating quality of chocolate. A mixture of several triglycerides has a lower melting point than would be predicted for the mixture based on the melting points of the individual components and will have a broader melting range than any of its components. Monoglycerides and diglycerides have higher melting points than triglycerides with a similar fatty acid composition. Polymorphism of Fats Solidified fats often exhibit polymorphism, i. The crystal form of the fat has a marked effect on the melting point and the performance of the fat in the various applications in which it is utilized. The crystal forms of fats can transform from lower melting to successively higher melting modifications. The order of this transformation is: In general, fats containing diverse assortments of molecules with varying fatty acids or fatty acids locations tend to remain indefinitely in lower melting crystal forms i. Beta Prime , whereas fats containing a relatively limited assortment of these types of molecules transform readily to higher melting crystal forms i. Mechanical and thermal agitation during processing and storage at elevated temperatures tends to accelerate the rate of crystal transformation.

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Chapter 5 : Iron(III) oxide - Wikipedia

Above melting, a liquid Â«lensÂ» may appear between two dry facets. Assuming that facet melting is not nucleated at the contact with such a lens, one may calculate the stability of such a structure, thereby accounting for the observed superheating of the crystal.

I am not an expert, I encourage you to view all of the pictures and feel free to contact me with any questions you may have prior to bidding. This is a used piece. Appropriate age and wear should be expected. So it is just not the postage that we pay for but also many other services connected with serving you better. When your item arrives as described, and in a timely manner, Please take a minute to leave the appropriate feedback. If for some reason there is a problem with your item contact me immediately and I will do what I can to make sure that we have a mutually pleasant transaction. Returns accepted,buyer will pay shipping both ways. Thank you for your understanding. Seller assumes all responsibility for this listing. Shipping and handling The seller has not specified a shipping method to Germany. Contact the seller- opens in a new window or tab and request shipping to your location. Shipping cost cannot be calculated. Please enter a valid postal code. Grand-Mere, Quebec, Canada Shipping to: Canada, United States Change country: There are 1 items available. Please enter a number less than or equal to 1. Select a valid country. Please enter 6 digits for the postal code. Domestic handling time Will usually ship within 5 business days of receiving cleared payment - opens in a new window or tab. Return policy The seller will not accept returns for this item.

Chapter 6 : Manganese(III) oxide - Wikipedia

During crystal growth the upper liquid was generally held 25 Â°0 above and the lower liquid 25 Â°0 below the melting point of the sample. It is suspected that.

Chapter 7 : Vanadium(V) oxide - Wikipedia

Solid crystals can be divided into four categories. 1) Metallic crystals. 2) Ionic crystals. 3) Covalent crystals.

Chapter 8 : Archive ouverte HAL - Surface melting and crystal shape

Andrew D. Bond On the crystal structures and melting point alternation of the n-alkyl carboxylic acids (Supporting Information) S3 S2. Calibration of the temperature at the sample.

Chapter 9 : 3 Vintage iitala Finland Crystal Pedestal Icicle glasses melting ice cube | eBay

Covalent Crystals: A covalent crystal has true covalent bonds between all of the atoms in the crystal. You can think of a covalent crystal as one big molecule. Many covalent crystals have extremely high melting points.