This is a brief introduction to the topic of solid state physics. Solid State Physics, often abbreviated as "SSP" is a field of physics that studies solids to understand their behavior at the atomic, molecular, and macroscopic level. To deepen your understanding beyond what this introduction can provide you with, please visit the Wikipedia page on Solid State Physics for more information. You can also find more about SSP by visiting pages like DensityFunctional Theory of Matter (DFT) and Scattering theory (structure function theory). This short article is only about the most basic of topics regarding solid state physics. It strives to explain why things happen how they do in SSP. If you want to learn more about the various topics in this subject, I recommend that you look into the Wikipedia pages listed above. This section is about physical phenomena that take place in solids when they are heated or cooled. Atoms may be very highly excited when they are heated (most of them are, really). Even though these excited atoms may lose energy when they cool down, they still have energy left over in their kinetic energy (kT) and potential energy (pe). This energy is often called the heat capacity, which is basically the amount of energy required to raise an atom by a small amount. If two atoms are close together in a solid, this proximity can cause an attraction to form between them. The closer they are, the stronger this attraction will be. This attractive force is sometimes called "Van der Waals force" in spite of it being named after the Dutch physicist Johannes Diderik van der Waals who first described it in 1873. The attractive force that exists between atoms when they are close together in solids has been demonstrated experimentally in various ways. The most common of these methods is called room temperature neutron diffraction. An atom in a solid will feel this attraction when it is hotter than about room temperature (T=298K). Atoms that are hot enough to cause this attractive force can be observed using various techniques such as X-ray scattering, neutron diffraction, and electron microscopy amongst others. When an atom is sufficiently close to another atom in a solid, the usual attraction between the two becomes stronger and one of them may be absorbed by the other atomic nucleus (similar to what happens with nuclear fusion in stars and nuclear fission in fission piles). The van der Waals force is responsible for the state of equilibrium in solids. This force between atoms is responsible for the reason why moving atoms cannot move easily through solids, even when they are heated past their melting point (the heat capacity of a solid prevents this). This section will begin to delve into quantum mechanics, though it is important to note that since SSP is primarily focused on the macroscopic scale (the length scales that we can measure), quantum mechanics can be safely neglected without much error. The previous section described how atoms in solids interact with one another using the van der Waals force.

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