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Short Communication

Thermodynamic Process in Carbon-Carbon Hybridization

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DESCRIPTION

Chemical thermodynamics is the study of relationship between heat, work, temperature and energy. It deals with the transfer of energy from one place to another and one form to another form. The main key concept is that, heat is a form of energy corresponding to a definite amount of mechanical work. For example, conversion of one gram of liquid water to gaseous is in the direction of increasing disorder, the molecules have being much more disorganized as a gas than as a liquid. The increase in entropy disorder is described as the change is positive.

Thermodynamics is classified into the following four branches:

- Classical thermodynamics;
- Statistical thermodynamics;
- Chemical thermodynamics;
- Equilibrium thermodynamics.

In classical thermodynamics, the matter is analysed with a macroscopic approach. Units such as temperature and pressure. In statistical thermodynamics, every molecule is under the spotlight, i.e. the properties of every molecule. Equilibrium thermodynamics is the study of transformations of energy and matter to the state of equilibrium. Chemical thermodynamics provides a bridge between the macroscopic properties of a substance and individual properties of constituent molecules and atoms. As thermodynamics explains about converting of graphite into diamond.

Graphite and diamond

All carbon atoms of Diamond are stated by chemical bonds, which make an ideal tetrahedron shape and finishing the crystal. The carbon atoms exist in the form of sp^3 hybridization, and the bond lengths of the carbon-carbon atom are equal [1]. The carbon atoms of Graphite shape or graphite molecular shape is sp2 hybridized, and they may be directed within side the equal plane, hence forming the hexagonal rings [2]. They have numerous layers of particles. Graphite consists of low electric conductivity of a low density approximately at 2.26 g/cm^3 .

As Graphite and diamond are of two forms which has same chemical element, i.e. Carbon. Properties could not be any more different to each other. In graphite, the carbon atoms are arranged in planar sheets which can easily glide to each other. The structure makes the material of very soft and can be used in products such as pencil lead [3]. On the other hand, the carbon atoms in diamond are strongly bonded in all directions; thus diamond is extremely hard. So, this process is not a physical change, but a chemical change.

Synthetic diamond has two main processes: high temperature, high pressure and chemical vapour deposition process. The technology of high temperature and high pressure process is very mature and forms an industry. The chemical vapour deposition process is still present in the laboratory. Graphite to Diamond conversion in which the graphite is more stable than diamond. Therefore, it takes some energy to convert graphite into diamond. Therefore, it is an example for endothermic reaction [4]. In the presence of high static pressure, high temperature, and transition metals, the mechanism of graphite-to-diamond conversion depends upon the pressure [5]. There are two ways. One is that the graphene layers are oriented in the same direction, and the other is that each successive layer is oriented in the opposite direction.

Processing of diamond

Sometimes hexagonal diamond found in meteorites. As when graphite is compressed and heated below the critical diamond-forming temperatures it is dissolved by metal and recrystallized into diamond under low-pressure conditions. With the increase of pressure, the direct conversion of graphite into diamond increases and graphite can be directly converted into full rigid stone without metal until 130,000 atmospheres and 3000°C.

Uses of diamond and graphite

- Diamond and graphite are allotropes of carbon that exist to provide different properties.
- Diamond and graphite are used in a variety of applications.

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- The atoms in graphite and diamond are strongly bonded with covalent bonds, forming different arrangements with each other.
- Diamonds are used in Jewellery making, construction, minor industrial applications, and surgeries.
- Graphites are used in stationery, lubricants, industries, or nuclear reactors.

CONCLUSION

In most of the cases chemical thermodynamics are internal degrees of freedom and processes, such as chemical reactions and phase transitions, which create entropy in the universe unless they are at equilibrium or maintained at a "running equilibrium" through "quasi-static" changes by being coupled to constraining devices, such as pistons or electrodes, to deliver and receive external work. Even for homogeneous bulk systems, the free-energy functions depend upon the composition of extensive thermodynamic potentials, including the internal energy.

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