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Diamonds as superior materials

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1. Introduction

The Diamond and its flawless shinning flare have probably done more to shape our life than any other things existed in this planet. It has given women fidelity and love, made men look rich and high class, opened up new lives, and offered us novel feeling. While in the technological world, scientists have found diamond very impressive because of its wide range of extreme properties, which are all the best. In this paper, we will walk through all aspects of diamonds and explain as much as we can its beauty as well as its super characteristics that make diamond so unique.

2. Natural diamonds

Diamond and its cousin graphite share the same chemistry, carbon, and covalent bonds but have very different structures, of course, the properties. Diamond is the hardest substance found on earth. While graphite is real soft, in fact, it is a pencil lead that we use every day. Diamond is an excellent electrical insulator; graphite is a good conducting material. Diamond is the ultimate abrasive; graphite is a very good lubricant. Diamond is transparent and graphite is opaque. All these differences can be explained by the fact that diamond crystallizes in three-dimensional structure with the cubic or isometric system, while graphite crystallizes only in two-dimensional structure with the flat hexagonal sheet (Rains and Sloane, 1998). Based on Bohr model, each carbon atom is a sphere, these atoms have packed closest under the heat and the pressure of volcano. This packing scheme has been a major unsolvable problem since 1611, when Kepler proposed his packing solution. Recently, Sloane with "On Kissing Numbers in Dimensions 32 to 128" (Thomas, 1998) , Hales with "An Overview of the Kepler Conjecture" (Simon, 1998) , and Singh with "Close-Packed Structures" (Crain *et al*., 1994) , have all agreed that Kepler solution may be right, and the cubic structure is the best use in packing spheres together. Diamond is the hardest and strongest substance found in nature, at least four times harder than the next hardest natural minerals that are sapphire and ruby. Hence, it is a perfect "10," defining the top of the hardness scale. Diamond has also the highest melting point of 3820 degrees Kelvin. Diamond is a good electrical insulator, and its resistivity at room temperature is 10^{16} Ωcm. Diamond can also be doped to reduce its resistivity to the range of 10 to 106 Ωcm. So, it becomes a semiconductor with a wide band gap of 5.4 eV. This process has opened a vast potential in modern electronics, (Vohra *et al*., 1986) . Diamond conducts heat better than anything else found on earth, five times better than the second best element, silver. It has highest known value of thermal conductivity at room temperature of 2 x103 W/m/K. Its thermal expansion coefficient at room temperature is 0.8x10-6 K, which is comparable with that of invar, the man-made alloy with a lowest expansion performance. No wander why diamond has found used in heat sinks, high

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