PROPERTIES, USES AND TYPES OF DIAMOND

Yakubjonov Fayzulloh Tursunali o‘g‘li
Andijan State technical institute, Andijan Uzbekistan.
Phone(0897)782 0909, E-mail: fdon411@gmail.com

Abstract. Diamond can also contain inclusions of aluminum (Al), silicon (Si), calcium (Ca), magnesium (Mg), iron (Fe), etc. Its high refractive index (2.42) promotes exceptional light dispersion. While the faces of rough diamonds have a greasy appearance, the luster on the cut faces is brilliant (adamantine luster). It is the hardest known mineral with a hardness of 10 on the Mohs logarithmic scale (10 times greater than that of corundum or its gem varieties, sapphire or ruby). Although diamond is extremely strong, it is fragile and can be easily crushed or split by impact along its octahedral cleavage planes.

Keywords: natural diamond, synthetic diamond, lab-grown diamond, industrial diamond, colored diamond, flawless diamond, hardness, brilliance, thermal conductivity.

Introduction. Natural diamond is a mineral composed of a single element, carbon (C). Its crystal structure is cubic. It generally occurs in the form of octahedral crystals with curved faces, cubic crystals being rarer. Diamond is usually colorless. However, the presence of inclusions of solid or fluid substances, imperfections in the crystal structure or irradiation can color it:

- blue or gray (boron inclusions);
- yellow (nitrogen inclusions);
- black (graphite inclusions);
- red, brown, orange or pink (deformation of the structure).

The standard unit for diamonds is the carat (ct), which is equal to 0.2 grams. Typically, diamond deposits have concentrations of more than 30 carats per 100

tonnes. Industrial diamonds are those that, due to their colour, impurity, size (weight) or shape, do not meet the requirements of the standards for gem-quality diamonds. More than 40% by weight of the world's diamond production is used for industrial purposes. The value of the latter is $0.50 to $5 US per carat, while that of a rough gem-quality diamond is around $230 US[1]. Synthetic diamonds are made from natural graphite, which is subjected to high temperature and high pressure in the presence of a catalyst. They are intended for the industrial market because of their small size. Use

Gemstone quality diamonds are used in jewelry. Because of their high value, they are the reason for the diamond exploration and mining world[2]. Industrial diamonds are mainly used as abrasives in drilling, cutting (sawing), grinding and polishing materials for many materials: rocks (granite, marble), steel, non-ferrous metals, carbon fibers, composite materials, glass, refractory materials, ceramics, concrete, plastics, masonry bricks. Diamond is used in the manufacture of certain so-called "diamond" tools and equipment: drill bits, segments for circular blades, grinding wheels, etc. It is also used in the automobile industry. There are many possibilities for using diamond in high-tech industries. It is used in the manufacture of:

1. new generation optical windows for high-power lasers and for the transmission of synchrotron radiation;
2. detectors for ultraviolet or ionizing radiation;
3. heat sinks to cool electronic components.

Experimental data and the physical characteristics of diamond indicate that this mineral was formed at great depths (>150 km) in the Earth's mantle under conditions of high pressure (>50 kbar) and temperatures (>1000 °C)[3]. On the surface, diamonds are associated with the eruption of rare and very specific volcanic rocks, kimberlites and lamproites. These rocks, rich in magnesium (or ultramafic) and volatile elements (H2O and CO2), come from great depths and

have transported with them the diamonds and various materials from the mantle. The eruption of these very fluid and volatile-rich magmas is explosive and very violent. It is at the origin of small volcanic edifices on the surface which will be rapidly eroded thereafter. In the case of kimberlites, these volcanoes overlie conical, core-shaped pipes less than a kilometre in diameter (typically 0.4 to 146 ha, rarely up to 200 ha) containing volcanic rocks, mantle rock fragments, and some diamonds[4]. These pipes and the underlying veins are usually the only remaining remnants of these volcanic episodes. An idealised model of a kimberlite pipe from South Africa is shown below.

Conclusion

When diamondiferous kimberlite is completely weathered and dismembered by erosion, its constituents can be transported over considerable distances by rivers and streams before deposition (Harben and Kuzvart, 1996). Diamondiferous alluvial deposits, or placers, accumulate along rivers, on shores at river mouths, and along coastal areas. Lamprophyre dykes sometimes contain diamonds. Lamprophyres are microgranular vein igneous rocks characterized by the abundance of black mica or brown amphibole, in large and small crystals, accompanied by either olivine (generally altered to talc, chlorite and clay minerals), feldspar, clinopyroxene or, sometimes, analcime (Foucault and Raoult, 1988).

References

1. Baymirzaev, A. (2024). New Methods of Obtaining Bearing Material from Steel. Web of Semantics: Journal of Interdisciplinary Science, 2(4), 25-28.

2. Rustamjan o'g'li, A. B., & Adhamjon o'g'li, A. A. (2025). STUDY OF ITS CHEMICAL PROPERTIESIN OBTAINING IIIX15 MATERIAL FROM SECONDARY MATERIALS. Science, education, innovation: modern tasks and prospects, 2(2), 92-95.

3. Tursunali o‘g‘li, Y. F. (2025). KUKUN METALLURGIYASI TOMONIDAN ISHLAB CHIQARILGAN ALYUMINIY ASOSIDAGI METALL MATRITSALI KOMPOZITSIYALAR BO ‘YICHA TADQIQOTLAR. INNOVATION IN THE MODERN EDUCATION SYSTEM, 5(48), 44-47.

4.Adaxamjonovich, O. Z. A. (2024). PRODUCTION OF COMPOSITE MATERIAL USING INDUSTRIAL WASTE. AMERICAN JOURNAL OF MULTIDISCIPLINARY BULLETIN, 2(3), 129-136.

5.Koraboyevna, A. S. (2025). TIRE MANUFACTURING TECHNOLOGY. Science, education, innovation: modern tasks and prospects, 2(2), 15-18.

6.Koraboyevna, A. S. (2025). APPLICATION OF 110G13L STEEL FOR EXCAVATOR BUCKETS IN THE MINING INDUSTRY. Science, education, innovation: modern tasks and prospects, 2(2), 1-4.

7. Ibragimovich, K. R. (2025). CUTTING TOOL COATING WITH ELECTRICAL SPARK PLASMA ASSISTED TECHNOLOGY USING WC-CO ALLOYS AND THEIR COMPOSITIONS. Science, education, innovation: modern tasks and prospects, 2(2), 53-55.

8. Umidbek Turg‘unboy o‘g, X., Islombek Turg‘unboy o‘g, X., & Muxammadamin o‘g‘li, M. A. (2024). PROSPECTS IN THE USE OF THERMOELECTRIC GENERATORS FOR VEHICLES. Ta'limning zamonaviy transformatsiyasi, 6(1), 62-66.

9.Umidbek Turg‘unboy o‘g, X. (2023). TECHNOLOGICAL EVALUATION OF GRAPHITE AND ITS PROPERTIES. Journal of new century innovations, 27(6), 68-73.

10.Tursunali o‘g‘li, Y. F., & Umidbek Turg‘unboy o‘g, X. (2024, April). ASSESSMENT OF TECHNOLOGICAL PROPERTIES OF MILLING TOOLS. In Proceedings of International Conference on Educational Discoveries and Humanities (Vol. 3, No. 5, pp. 281-285).