

Diamond Exploration



Diamonds, the hardest of all minerals, are not only used in the jewelry industry, but are present in many technologies which need resistant smooth-cutting tools. Diamonds form at a depth greater than 150 kilometres within the earth in distinctive parent rocks called kimberlites. Kimberlites also include several characteristic minerals that are very important as indicators in diamond exploration activities.

In North America, isolated discoveries of diamonds at surface were reported during the first half of the 19th century, and in September 1991, the first kimberlite was discovered in the Lac de Gras area in the Northwest Territories.

This topic explains the formation of diamonds and the exploration methods used to trace diamond sources. It also gives the history of diamond exploration and information on the first diamond mine opened in Canada.

Historical Facts

- 1863: A Diamond was found in glacial debris in Ontario.
- 1920: A 33-carat diamond was found during the construction of a railway track, near Peterborough, Ontario.
- 1960's: Discovery of small diamonds was reported east of Prince Albert, Saskatchewan.
- 1971: A 0.25-carat gem quality diamond was discovered in the glaciofluvial sediment of an esker, near Timmins, Ontario.
- 1981: Diamond indicator minerals were found near the Mackenzie Range at the Yukon/Northwest Territories border.
- September 1989: Diamond exploration efforts intensified in the Northwest Territories. Very high concentrations of diamond indicator minerals were found in the Lac de Gras area, which suggested the location of a diamondiferous kimberlite pipe.
- Following this discovery, an unprecedented surge in exploration for diamonds happened in Canada. For the first time, major diamond exploration companies faced competition from a number of small, but technically proficient, exploration companies.

- October 14th 1998: BHP Diamonds Inc./Dia Met Minerals Ltd. announced the official opening of Canada's first diamond mine: the Ekati Diamond Mine, Lac de Gras area, in the Northwest Territories.

Question:

From the first diamond discovery in Canada to the opening of the first diamond mine, why did so much time pass?

Answer

- Most kimberlites are well hidden under a thick blanket of glacial material or under lakes.
- The occurrence of several glacier advances that moved the eroded sediments in several different directions, independently of the landscape.
- The complicated ice flow routes make mineral indicators difficult to trace.
- Time needed for the development of new techniques and technologies, such as heavy mineral processing, petrology, geophysics, etc.
- Difficulties in finding and putting together a team with all the different expertise needed to perform all the necessary analysis.
- Time needed to sample the terrain: Canada is a very large country.
- Time needed to perform all the series of studies and analyses.
- Difficulties in finding money needed to finance such exploration.
- Requirement to perform several environmental studies and negotiate agreements with all stakeholders involved.

All these factors were obstacles, the quick realization of a project such as the exploitation of a diamond mine in Canada.

Properties and Usefulness of Diamonds

Diamond is a mineral composed of carbon. Its dense crystal structure makes diamond the hardest substance known. Diamonds are completely transparent to a broad segment of the electromagnetic spectrum, which makes them useful in industrial, technological and scientific applications. Diamonds are also nonmetallic, do not conduct electricity and have a great thermal conductivity.

Diamonds are not only used in the jewelry industry, but are present in many technologies. Diamonds are used for machining plastic, glass and metal pieces necessary in products such as laser printer drums, polygon mirrors, automobile engine pistons, telephone, television, computers, CD players, etc.

Diamonds can be made into ultra-hard and smooth cutting knives and scalpels for extremely precise surgery. Their resistance to wear becomes an asset in automated processes that need to make large number of copies of a same product, without having to replace the cutting tool. Diamonds are also part of dental drills. Their hardness also makes them useful as abrasive and grinding material.