

Diamonds

1. Introduction

When the topic of diamonds is brought up, most people probably consider the most expensive jewelry one can buy. They do not consider how these minerals were formed, where they tend to be mined, or any potential risk that countries face as a result of these very expensive stones. Even if people do think about the creation of diamonds, their intel may be incorrect. An example of this is the common misconception that diamond is made by coal, which is discussed by Robertson (2006). While this can be true if coal is buried deep enough where the pressure and temperature, the end result is lousy diamonds (Robertson 2006). There is also knowledge that is correct, like the common belief that diamond is one of the hardest minerals that can be found in Earth. But overall the knowledge of a mineral that people wear is about as limited as it can be, so learning about processes that create diamonds, and the conflicts diamonds can cause can be an eye-opening experience.

3. Canada's Diamond Mines

When looking at Canada's diamond mines, the characteristics vary depending on the mine. When John J. Gurney (2004) and other researchers were looking at the Ekati Diamond Mine (located in the Northwest Territories of Canada) they recorded the large amount of variety that can be seen, even within the one mine. This mine has a variety of crystal colours, crystal forms, and the texture of the diamonds (Figure 2). The study area can be shown to vary when looking at specific areas, such as the Northwest area which is unique because it has the most colourless octahedra, whereas the pipe named Piranha is unique for having a large amount of colourless cubes (Gurney, Hildebrand, Carlson, Fedortchouk, and Dyck, 2004). The Ekati Mine also has its own set of mining procedure, which is discussed in by Michael W. Martin and Dwayne D. Tannant (2004). The article concentrates on the specific kimberlite pipes named Koala, North Koala, and Panda. When mining, whether it is at the surface or underground, the joints and faults have a deciding factor on how the mining is handled, due to the fact they dictate the excavation stability. In order to conclude how stable the mine is, the engineers divide the rock mass into similar zones. By doing this, they are able to making a proper inference over the stability of the zone, when comparing to the predetermined stability of other zones with a similar mass (Martin and Tannant, 2004). The Ekati Diamond Mine is not the only mine located in Canada, there are many including the kimberlite complex in Slave Craton, Canada. O.A Ivanova, A.M Logvinova, and N. P. Pokhilenko (2017) looked at the diamonds from this area and found that the diamonds there were crystallized at the base of an unusually thick lithospheric mantle as a result of being enriched in high potassium carbonate-silicate melts (that was volatile) and with the perioditic substrate (normally found in upper mantle.) This conclusion was furthered by the diamonds having high-silica mica, coesite, K-clinopyroxene, and carbonates. The fact that the diamonds also had an abnormal amount of enstatite inclusions (more than regular) led to the belief that these diamonds belonged to the harzburgite type of paragenesis (Ivanova, Logvinova, and Pokhilenko, 2017).

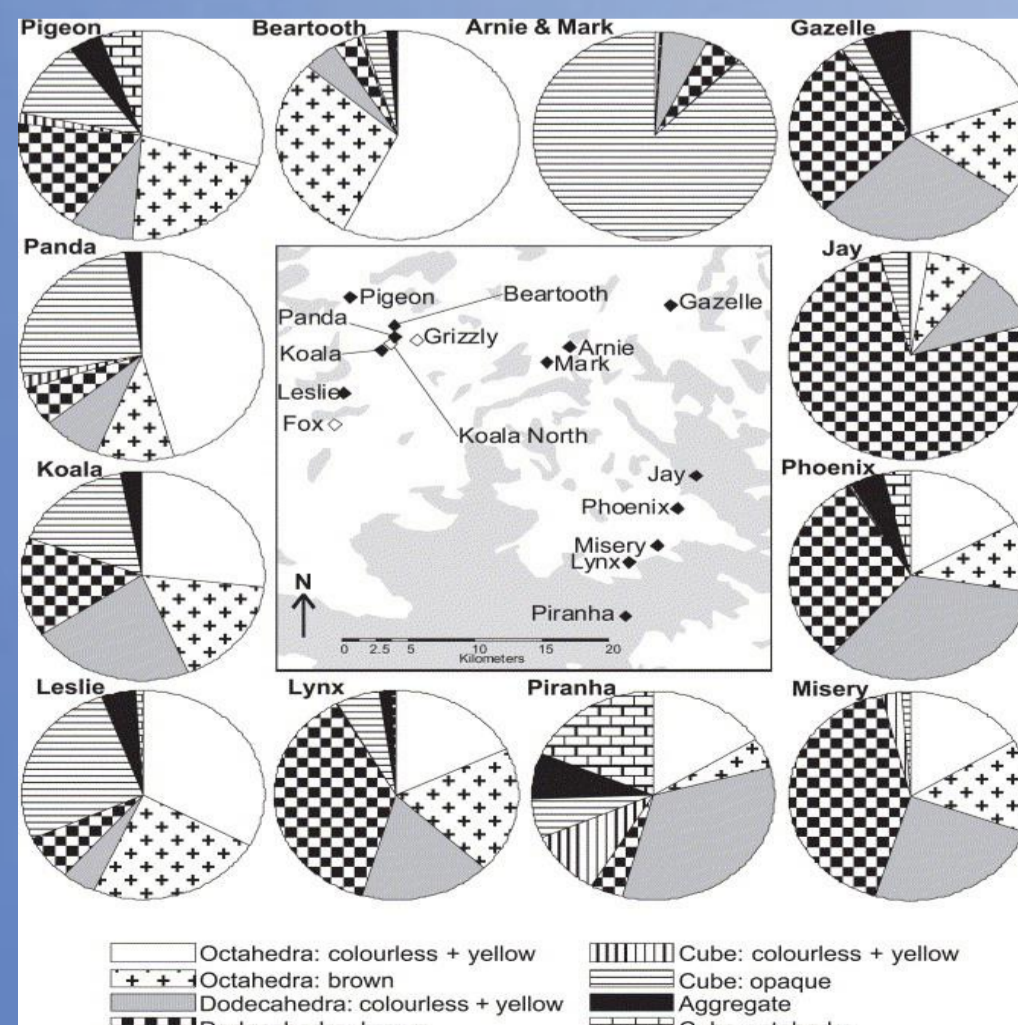


Figure 2: Shows the amount of variety in the different kimberlite pipes of The Ekati Mine (Gurney et al. 2004).

4. Conflict Diamonds

Blood diamonds (also known as conflict diamonds) have harmed many people, and this has caused the world to take a stance against the purchase of these diamonds. In "Blood Diamonds" and Africa's Armed Conflicts in the Post—Cold War Era; Paul Orogun discusses what the goals are of the people acquiring the diamonds. Orogun (2004) illustrates that the acquisition of the diamonds is for the purpose of selling them illegally in order to acquire weapons including guns and landmines. These actions have been found to cause major human rights issues along with some examples of government and regional destabilization (Orogun, 2004). Nigel Davidson (2016) looked at how the conflict diamonds first came into the world's spotlight, and it was because Global Witness linked the conflict in Angola to the mining of these diamonds. The diamonds are used to fuel rebellions in most cases, including in Angola. This is against international law. International law also has rules against warfare. As Davidson states in his article, warfare is not illegal, but there must be a distinction made between participants (i.e soldiers) and people that are not participating and should not be targeted (i.e civilians.) The human rights violations that occurred in Angola paid no mind to international law and instead were looking to take power, the victims did not matter (Davidson, 2016). The attempts to legitimize the diamond trade and stop the acquisition of conflict diamonds has been done through the creation of the Kimberley Process. Steven Van Bockstael and Koen Vlassenroot (2009) discuss the importance and contents of the Kimberley Process in *From conflict to development diamonds: The Kimberley Process, and Africa's artisanal diamond mines*. The Kimberley Process effectively ended the wars that were occurring in not only Angola, but also countries such as Sierra Leone. Even though there has been progress for conflict diamonds, Van Bockstael and Vlassenroot go onto discuss the continued wars over resources, and the need to create more legislature that helps eliminate all such resource wars (Van Bockstael and Vlassenroot, 2009.)



Figure 3: This picture shows the people at work mining conflict diamonds (ISSAfrica.org, 2013).

2. Diamonds: Formation, Composition, and Where they can be Found

Diamonds are primarily found in kimberlite, but the composition can vary depending on the location of the diamond deposit, but also between diamonds within the same mine. Deines, Stachel and Harris (2009) looked at the variety in different kimberlite deposits. When analyzing the diamonds found in Damtshaa kimberlites, Letlhakane kimberlites, and Orapa kimberlites; researchers discovered that even though there are similarities between the diamonds, the $\delta^{13}C$ distribution was different between each one of them. Showing that diamonds from different kimberlite pipes have unique features that can only be found in that specific type of kimberlite (Deines, Stachel, and Harris, 2009). As W. Goldschmidt (2013) discusses in his 2013 article, the evidence for a Dachine diamond being affected by the melting of a subducting plate are the different textures and the different chemical composition which has led to its identification as a pyroclastic komatiite. These types of diamonds have a composition that is unique due to the fact that it has low C isotopes and heavy N isotopes, along with evidence of deformation (Goldschmidt, 2013.) Diamonds also help explain a question that has been discussed regarding subducting plates. The question is over how much of the carbon that goes down into the mantle eventually come up. Peter B. Kelemen and Craig E. Manning (2015) came to the conclusion that whatever amount of carbon went down into the mantle of the Earth eventually found its way moving upwards. So the carbon was being reallocated to different minerals and can help explain why some diamonds contain sedimentary carbon, which is found in the subducting oceanic plate (Figure 1) (Kelemen and Manning, 2015). Diamonds can also be formed deeper in the mantle, these are called deep diamonds, and can be seen in the article by Tappert et al. (2005). These types of diamonds are formed at deeper than 250 km below surface level and are rare, they can be identified by the existence of an excess amount of silicon (Tappert, et al., 2005).

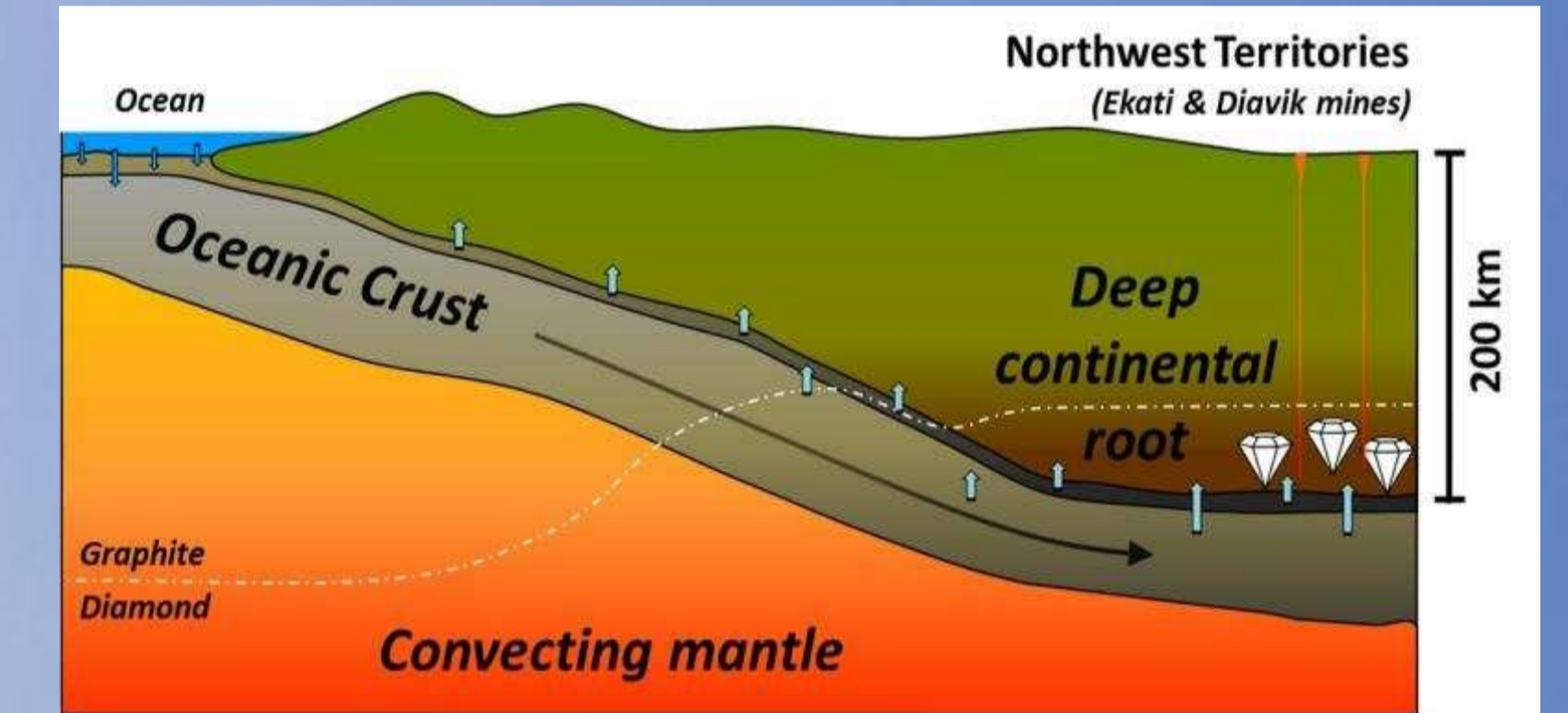


Figure 1: showing the process of subduction. As the oceanic crust subducts beneath the deep continental root, some of the crust melts. This has an effect on the composition of the diamonds (Cameron, 2015).

5. Conclusion

Diamonds are beautiful for jewelry, and the ability to purchase anything involving diamond makes people feel good about themselves, there is no doubt over that. However, diamonds play a much bigger part in the economics of countries and people should want to learn about that. Natural Resources of Canada had Canada as the second largest producer of diamonds (volume) at 15.4% and had Canada making an annual profit of \$2.7 billion dollars off of exports alone (Natural Resources of Canada, n.d). Diamonds are a big part of Canada's economic stability and unless a person is going out of their way to find out this information, this knowledge is known to very few people.

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