Coloured Diamonds

Diamonds can be found in almost all colours of the rainbow, produced naturally or generated through various treatments (usually irradiation). As we learned in the previous section, the natural colour of diamond is primarily related to its classification type, and therefore the types of impurities that are present. Another important variable for generating colour in diamonds is deformation of the crystal, which results in tiny changes in the arrangement of atoms within a crystal (sort of like the actions of bending and buckling but on an atomic scale). Vacancies in the crystal structure are also very important in generating colour and are often tied to the deformation of the crystal lattice. A vacancy is when a 'hole' exists in the crystal lattice where there would normally be an atom.

It takes very little of an impurity, cation site vacancy, or crystal defect to generate vivid colours in stones (as we will see later with the conventional coloured stones). As a result of the subtle differences, not all colours have been fully explained. This means there are likely multiple explanations for similar colours in diamond. For example, not all diamonds of a particular brown hue have acquired that hue in exactly the same way. The following table lists the colours naturally exhibited by diamond, their most common natural causes, and notable specimens.

|  |  |  |
| --- | --- | --- |
| **Colour** | **Type and Cause** | **Notable Specimens** |
| Colourless | IIa, pure | Best achievable is 'D' colour, theses stones command premium prices |
| Blue to grey | IIb, Boron | *Hope Diamond* |
| Yellow to orange, subdued to intense, as well as almost colourless | Ia, Nitrogen | *Tiffany Diamond* |
| Pink, purple, red, cognac | Usually Ia, colour likely from deformation of crystal structure | *Rob Red*and*Agra Diamonds*. |
| Green | natural irradiation | [*The Dresden Green*](https://connect.ubc.ca/bbcswebdav/pid-2559790-dt-content-rid-10494222_1/courses/SIS.UBC.EOSC.118.99C.2014WC.44220/Course_Files/moduleB/lesson09/download/DresdenGreen_1990G_G.pdf) (a Type IIa diamond too!) |
| Black | abundant graphite and other opaque inclusions | *Black Orlov* |

Of all the diamond colours, green diamonds and red diamonds are the most rare of all diamond types due to their unique conditions of formation. Other very rare diamond "colours" include "chameleon diamonds" which change colour upon gentle heating, and are thus termed 'thermochromic'. Although it sounds spectacular, the colour changes are usually very subtle and shift between pale browns, yellows and greens.

Yellow diamonds: from the rough starting material to the oval shaped-cut final product. Photo courtesy of the [Gemological Institute of America](http://www.gia.edu/).

Pink diamonds: from the rough starting material to the marquise shaped-cut final product. Photo courtesy of the [Gemological Institute of America](http://www.gia.edu/).

Pink and colourless diamond octahedrons from the Argyle Mines in Australia. Photo courtesy of [Argyle Diamonds](http://www.argylediamonds.com.au/).

The DeYoung Red Diamond is of the finest red colour and large size (5.03 carats). It has a round brilliant cut and good clarity (Graded at VS2). Acquired through an estate auction, it was originally thought to be a normal red garnet! Photo courtesy of the Smithsonian [National Museum of Natural History](http://www.mnh.si.edu/).

Pale green diamond with marquise shape. Photo courtesy of the [Gemological Institute of America.](http://www.gia.edu/)

"Chameleon Diamond" that shows green colouration before heating and yellow colouration after heating to ~150 degrees celcius. Cooling will restore the green colour. Photo from[Hainschwang et al 2005.](http://www.gia.edu/)

Brown diamond with round brilliant shape. Photo courtesy of the [Gemological Institute of America](http://www.gia.edu/).

Blue diamond with pear shape. Photo courtesy of the [Gemological Institute of America](http://www.gia.edu/).

Blue-green diamond (1.57 carats) with oval shape - Also see the [GIA Grading Report](https://connect.ubc.ca/bbcswebdav/pid-2559790-dt-content-rid-10494222_1/courses/SIS.UBC.EOSC.118.99C.2014WC.44220/Course_Files/moduleB/lesson09/download/gia_1.57_figb.pdf).

The ~41 carat Dresden Green Diamond housed in the Green Vaults of Germany- Optional:[1990 G&G Article](https://connect.ubc.ca/bbcswebdav/pid-2559790-dt-content-rid-10494222_1/courses/SIS.UBC.EOSC.118.99C.2014WC.44220/Course_Files/moduleB/lesson09/download/DresdenGreen_1990G_G.pdf).

Coloured diamonds are generally more expensive than colourless diamonds; however, weakly coloured stones are usually less desirable than perfectly colourless diamonds. There is a bit of subjectivity and marketing skill for pricing intermediate off-colour diamonds. Strongly coloured diamonds (of which only a dozen or so are found globally per year) on the other hand, can be extremely valuable and command top dollar per carat. In natural stones, the best reds, blues, and greens can cost on the order of ~$1,000,000 per carat or more depending on the history of a stone. Green diamonds and red diamonds are the most rare of all diamond types due to their unique conditions of formation. The 35.56 carat Wittlesbach blue diamond recently sold at[Christie's Fine Art Auctions](http://www.christies.com/) for $24.3 million USD, about ~$680,000 per carat!