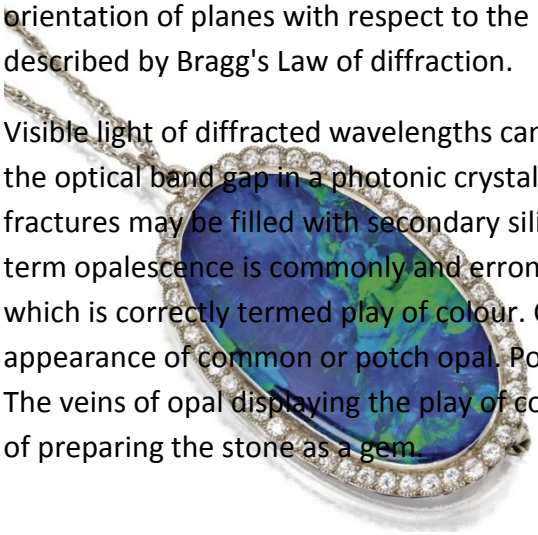
OPALS

Opal is a hydrated amorphous form of silica; its water content may range from 3% to 21% by weight, but is usually between 6% to 10%. Because of its amorphous character it is classed as a mineraloid, unlike the other crystalline forms of silica which are classed as minerals. It is deposited at a relatively low temperature and may occur in the fissures of almost any kind of rock, being most commonly found with limonite, sandstone, rhyolite, marl and basalt. Opal is the national gemstone of Australia, which produces 97% of the world's supply. This includes the production of the state of South Australia, which amounts to around 80% of the world's supply.

The internal structure of precious opal makes it diffract light; depending on the conditions in which it formed it can take on many colours. Precious opal ranges from clear through white, gray, red, orange, yellow, green, blue, magenta, rose, pink, slate, olive, brown, and black. Of these hues, the reds against black are the most rare, whereas white and greens are the most common. It varies in optical density from opaque to semi-transparent. For gemstone use, its natural colour is often enhanced by placing thin layers of opal on a darker underlying stone, like basalt. Common opal, called "potch" by miners, does not show the display of colour exhibited in precious opal.

Precious opal shows a variable interplay of internal colours and even though it is a mineraloid, it has an internal structure. At micro scales precious opal is composed of silica spheres some 150 to 300 nm in diameter in a hexagonal or cubic close-packed lattice. These ordered silica spheres produce the internal colours by causing the interference and diffraction of light passing through the microstructure of the opal. It is the regularity of the sizes and the packing of these spheres that determines the quality of precious opal. Where the distance between the regularly packed planes of spheres is approximately half the wavelength of a component of visible light, the light of that wavelength may be subject to diffraction from the grating created by the stacked planes. The spacing between the planes and the orientation of planes with respect to the incident light determines the colours observed. The process can be described by Bragg's Law of diffraction.



Visible light of diffracted wavelengths cannot pass through large thicknesses of the opal. This is the basis of the optical band gap in a photonic crystal, of which opal is the best known natural example. In addition, micro fractures may be filled with secondary silica and form thin lamellae inside the opal during solidification. The term opalescence is commonly and erroneously used to describe this unique and beautiful phenomenon, which is correctly termed play of colour. Contrarily, opalescence is correctly applied to the milky, turbid appearance of common or potch opal. Potch does not show a play of colour.
The veins of opal displaying the play of colour are often quite thin, and this has given rise to unusual methods of preparing the stone as a gem.

An opal doublet is a thin layer of opal, backed by a swart mineral such as ironstone, basalt, or obsidian. The darker backing emphasizes the play of colour, and results in a more attractive display than a lighter potch. Combined with modern techniques of polishing, doublet opal produces similar effect of black or boulder opals at a mere fraction of the price. Doublet opal also has the added benefit of having genuine opal as the top visible and touchable layer, unlike triplet opals.

The triplet-cut opal backs the coloured material with a dark backing, and then has a domed cap of clear quartz or plastic on top, which takes a high polish and acts as a protective layer for the opal. The top layer also acts as a magnifier, to emphasize the play of colour of the opal beneath, which is often of lower quality. Triplet opals therefore have a more artificial appearance, and are not classed as precious opal.

Besides the gemstone varieties that show a play of colour, there are other kinds of common opal such as the milk opal, milky bluish to greenish (which can sometimes be of gemstone quality); resin opal, which is honey-yellow with a resinous luster; wood opal, which is caused by the replacement of the organic material in wood with opal; menilite, which is brown or grey; hyalite, a colourless glass-clear opal sometimes called Muller's Glass; geyserite, also called siliceous sinter, deposited around hot springs or geysers; and diatomite or diatomaceous earth, the accumulations of diatom shells or tests.

Fire opals are transparent to translucent opals with warm body colours of yellow, orange, orange-yellow or red. They do not usually show any play of colour, although occasionally a stone will exhibit bright green flashes. The most famous source of fire opals is the state of Querétaro in Mexico; these opals are commonly called Mexican fire opals. Fire opals that do not show play of colour are sometimes referred to as jelly opals. Mexican opals are sometimes cut in their ryholitic host material if it is hard enough to allow cutting and polishing. This type of Mexican opal is referred to as a Cantera Opal. There is also a type of opal from Mexico referred to as Mexican Water Opal, which is a colourless opal which exhibits either a bluish or golden internal sheen.

Girasol opal is a term sometimes mistakenly and improperly used to refer to fire opals as well as a type of transparent to semi-transparent type milky quartz from Madagascar which displays an asterism, or star effect, when cut properly. However, there is a true girasol opal that is a type of halite opal, that exhibits a bluish glow or sheen that follows the light source around. It is not a play of colour as seen in precious opal but rather an effect from microscopic inclusions. It is also sometimes referred to as water opal as well when it is from Mexico. The two most notable locations of this type of opal are Oregon and Mexico.

Peruvian opal (also called blue opal) is a semi-opaque to opaque blue-green stone found in Peru which is often cut to include the matrix in the more opaque stones. It does not display pleochroism. Blue opal also comes from Oregon in the Owhyee region as well as from Nevada around Virgin Valley.

Australia produces around 97% of the world's opal. 90% is called 'light opal' or white and crystal opal. White makes up 60% of the opal productions but cannot be found in all of the opal fields. Crystal opal or pure hydrated silica makes up 30% of the opal produced, 8% is black and only 2% is boulder opal.

The town of Coober Pedy in South Australia is a major source of opal. The world's largest and most valuable gem opal "Olympic Australis" was found in August 1956 at the "Eight Mile" opal field in Coober Pedy. It weighs 17,000 carats (3450 grams) and is 11 inches (280 mm) long, with a height of 4 3⁄4 inches (120 mm) and a width of 4 1⁄2 inches (110 mm).The Mintabie Opal Field located approximately 250 km north west of Coober Pedy has also produced large quantities of crystal opal and also the rarer black opal. Over the years it has been sold overseas incorrectly as Coober Pedy Opal. The black opal is said to be some of the best examples found in Australia.

Andamooka in South Australia is also a major producer of matrix opal, crystal opal, and black opal. Another Australian town, Lightning Ridge in New South Wales, is the main source of black opal, opal containing a predominantly dark background (dark-gray to blue-black displaying the play of colour). Boulder opal consists of concretions and fracture fillings in a dark siliceous ironstone matrix. It is found sporadically in western Queensland, from Kynuna in the north, to Yowah and Koroit in the south. Its largest quantities are found around Jundah and Quilpie (known as the "home of the Boulder Opal" in South West Queensland. Australia also has opalised fossil remains, including dinosaur bones in New South Wales, and marine creatures in South Australia.[citation needed] The rarest type of Australian opal is "pipe" opal, closely related to boulder opal, which forms in sandstone with some iron-oxide content, usually as fossilized tree roots.

The Virgin Valley opal fields of Humboldt County in northern Nevada produce a wide variety of precious black, crystal, white, fire, and lemon opal. The black fire opal is the official gemstone of Nevada. Most of the precious opal is partial wood replacement. The precious opal is hosted and found within a subsurface horizon or zone of bentonite in-place which is considered a "lode" deposit. Opals which have weathered out of the in-place deposits are alluvial and considered placer deposits. Miocene age opalised teeth, bones, fish, and a snake head have been found. Some of the opal has high water content and may desiccate and crack when dried. The largest producing mines of Virgin Valley have been the famous Rainbow Ridge, Royal Peacock, Bonanza, Opal Queen, and WRT Stonetree/Black Beauty Mines. The largest unpolished Black Opal in the Smithsonian Institution, known as the "Roebling Opal," came out of the tunnelled portion of the Rainbow Ridge Mine in 1917, and weighs 2,585 carats. The largest polished black opal in the Smithsonian Institution comes from the Royal Peacock opal mine in the Virgin Valley, weighing 160 carats, known as the "Black Peacock."

Another source of white base opal or creamy opal in the United States is Spencer, Idaho. A high percentage of the opal found there occurs in thin layers.

Other significant deposits of precious opal around the world can be found in the Czech Republic, Slovakia, Hungary, Turkey, Indonesia, Brazil (in Pedro II, Piauí, Honduras, Guatemala, Nicaragua and Ethiopia.

In late 2008, NASA announced that it had discovered opal deposits on Mars.

7 Bleeding Heart Yard Hatton Garden London EC1N 8SJ 020 7405 1536