

OPAL

By Keith Tucker

From a faceters point of view opal is not a favourite stone as only two types are really suitable for this.

Opal is a non crystalline mixture, being an hydrated silica. It is considered to be a "hardened jelly". With a chemical composition is $\text{SiO}_2\text{nH}_2\text{O}$ it has the same chemical make up as quartz with the addition of the small quantity of water (nH_2O) - anywhere between 1% and 21% by volume, although precious opal tends to be maximum 10% - this precludes crystallisation.

Generally found filling seams in rocks or coarse sandstones and clays, opal permeates and solidifies creating veins. Occasionally It may be found as botryoidal deposits and even as stalagmitic formations and, also, unusually, as fossils.

There are four basic types of precious opal:

White opal, where the body is light coloured to milky white, and where there is a play of colour. The base colour may be other than white, i.e. pale shades of green or grey, but they nevertheless fall into the category of white opal.

Black Opal is where the body is black or dark blue, dark green or dark grey. Again, vivid flashes of colour are associated with it.

Fire opal is a transparent to translucent material, ranging in colour from fiery red through orange to totally clear and transparent. Fire opal may or may not show play of colour. It may be considered as acting more as a filter, allowing only red and orange light to pass.

Water opal, also known as crystal or jelly opal, the last of the four, is a clear variety of opal but is recognised by the flashes of colour in what appears to be a featureless background.

Of the four varieties above, only the fire opal and the water opal lend themselves readily to faceting, whilst all four varieties are regularly seen as cabachons. In the case of cabachons, the oval appears to be the preferred choice of cut, but the stone may also be cut as a baroque in order to conserve precious material. Fire opal when faceted produces an "amorphous" appearance unlike crystalline faceted stones.

Opal has a hardness of $5\frac{1}{2}$ to $6\frac{1}{2}$, an S.G. OF 1.98-2.20, and a refractive index of 1.44 and 1.46. Fire opal may be less, down to around 1.37. It is singly refractive with no cleavage or birefringence. Streak is white, and fracture conchoidal or irregular.

How does opal account for its play of colour? This lies in the structure of the material. Opal is composed of thousands upon thousands of tiny spheres laid out in a series of lattices piled layer upon layer above one another. The size of the spheres vary according to the colour they exhibit, but are of the order of 0.001 mm in diameter.

Perhaps an analogy to describe this would be to imagine a fish tank with a bottom layer of marbles laid out in rows with all marbles touching their adjacent neighbours. Place another similar layer on top of the first layer and keep repeating this until the tank is full. The resulting block portrays the structure of opal. The play of colour occurs as a result of interference patterns of light passing through or into the structure and being reflected or refracted from it.

Different sizes of spheres account for the different interference patterns and the play of colour is therefore like that of an oil slick on water changing to reveal different colours as the position of the eye changes. This play of colour is termed iridescence, whilst opalescence is the pearly appearance caused by short wave reflections.

Because of its unique structure, opal should not be immersed in anything but cold water, and cleaning fluids should be avoided. Immersion in water can sometimes refresh an ailing stone, by replacing the dried out water content.

All this is fine, but where does opal come from? It is a very well known fact that our cousins in Australia are sitting upon what must be the best deposits in the world. The mining areas of Coober Pedy, Lightning ridge, Andamouka, and White Cliffs are all familiar names to us, to name but a few. Yowah Homestead is the home of the Yowah nuts – small pebbles about the size of a walnut, similar to a geode, where the opal is restricted to the core or veils surrounding the core, but not breaking surface. I will not therefore attempt to comment on the glory of these regions, but rather leave this to Australians and hope someone there may follow through with more articles of the outback and their famous mines.

Other regions of the world mining opal include, but are not restricted to The U.S.A., Zimbabwe and South Africa, where dendritic opals are also mined, Brazil, Mexico (fire opal) and Honduras. In Europe, Czechoslovakia reigned supreme until Australian production took first place in the late nineteenth century, it now produces relatively little commercial opal.

Opal is the birthstone for October, but regrettably carries a superstition that it is the bearer of bad tidings. A great pity when it has such beauty.