

In 1893, Nobel Prize-winning French scientist Dr. Henri Moissan discovered minute quantities of a new mineral, natural silicon carbide. The mineral was located in an ancient meteorite found in the Diablo Canyon in Arizona. Later named "moissanite" in honor of Dr. Moissan, this mineral's supply was too limited for jewellery use.

More than a century later, Cree developed a process for producing large, single crystals of moissanite. In 1995, a master diamond cutter observed samples of the silicon carbide crystals and suggested to the founders of Charles & Colvard that, if properly cut, the crystals could make a beautiful jewel.

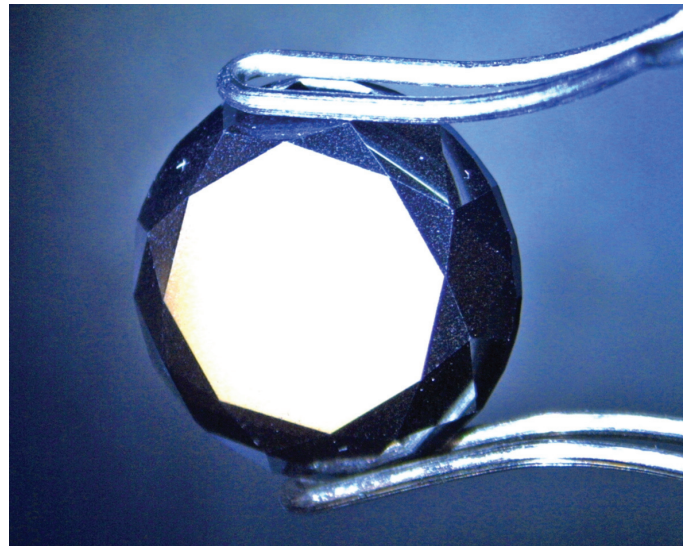
# CLEAR AS NIGHT

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Black stones are becoming increasingly popular in jewellery – also as loose stones sold on the Internet. Take a look at the fashion magazines on the shelves around you. Black is in vogue.

The colour of many iron- or magnesium-rich minerals and "ferro-mags" are one of the largest of the mineral groups. Some of these black gems are designed to imitate a black diamond – either the natural, HPHT, or irradiated versions. A host of materials have been parading as a variety of black gems with many of them other than what they were labeled. With the proliferation of these impersonators many jewellers and appraisers frequently call Stone Group Laboratories needing help in the identification of these materials.

There are not many tests a traditional gem lab can perform on high-RI, opaque black gems. Black moissanite is commonly represented as black diamond; black tourmaline or darkly irradiated quartz is commonly represented as black spinel. Even black cubic zirconia turns up occasionally. We will try to show some features to help identify these gems, but full identification of some materials and treatments still requires advanced laboratory equipment.



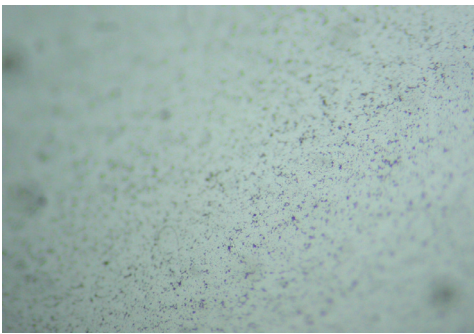
**Black moissanite - lustre.**

As there is little shortage of natural black gem materials, those that are mostly encountered are natural, except when it comes to high lustre gems. The lustre of diamond is often the first clue to correct identification. Few gem materials take a polish like diamond, as lustre is closely tied to hardness. Most valuers will be familiar with the features of natural black diamonds, which will often exhibit some degree of translucency when viewed with strong transmitted light, as well as multiple natural, dark inclusions that give it its colour. Most difficult to separate is the HPHT treated black diamond from natural. The irradiated version is often far more perfect in surface texture, as they often lack the proliferation of inclusions that characterize many natural and HPHT black diamonds. These colour determinations are best left to laboratories. All will test as diamond on thermal testers, but with most thermal diamond testers, so will moissanite, including the black version. With careful observation, black moissanite can usually be identified without the use of lab equipment.

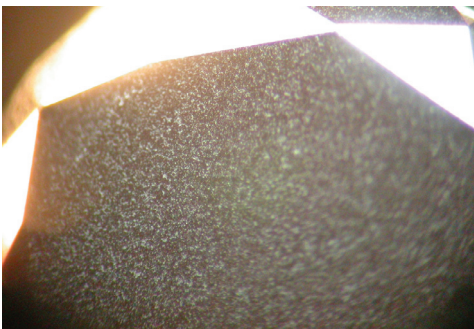
While the cause of colour in black moissanite is not known, it does test as silicon carbide in Raman testing, matching its near-colourless variety. It will test as diamond on thermal testers, but we have not had the opportunity to test on the electrical conductivity testers designed for



**Black stone group.**



Black moissanite - surface.



Black moissanite - surface 2.



Brown translucency at edge of black quartz.

moissanite. It is likely a polycrystalline variety, and more research needs to be done on this material. Other than advanced testing, visual clues are the best means of identifying it. It will have an adamantine, mirror-like lustre and be completely opaque, but it will have a particular surface texture in reflected light when viewed under magnification. This texture might best be compared to fine-grained black granite. The texture is due to slightly different qualities of black as well as lustre, almost appearing as a series of fine surface irregularities. It is this observation that makes us believe moissanite is a polycrystalline material. This graininess is quite even in distribution and is different than the random surface irregularities due to inclusions in natural or HPHT black diamonds. This texture, only observed under magnification, is unexpected, due to the mirror-like lustre of the stones. In natural black diamond, surface pitting is common, but is not even across all surfaces.

Black spinel, once referred to as *ceylonite*, varies in properties from the more familiar, transparent blue or red spinel. Black spinel is better referred to as part of the spinel group, as its chemistry varies from the more familiar transparent, coloured spinel. In Thailand, black spinel is commonly referred to as "nin", but this term is now widely applied to a variety of black stones, so purchasing *nin* will not ensure you are buying spinel. There is also a transparent spinel of nondescript colour that is sometimes marketed as "black spinel", but it is transparent and not a true black, but rather more of a dark blue or blue-green. Opaque black spinel is very high in iron content, giving it a much higher RI and SG than other spinel, most testing over the limit of the refractometer. It is also magnetic, due to a high iron content. Other imitations we have seen have been black tourmaline (much lower lustre and RI), over-irradiated smoky quartz (much lower RI and some translucency along thinner edges), black sapphire (very dark blue or green with RI of corundum), and black CZ (Refractometer, easily scratched by diamond.)

For some of these black gems, full confirmation is only possible with advanced equipment but many options can be eliminated with these tests, along with careful observation. All of these materials with the exception of diamond, are inexpensive, but will have varying hardness properties. And, all products should be what they are represented as.

### Acknowledgements

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Gem Material	Hardness	RI	SG	Lustre	Translucency	Magnetic	reflectometer	Visual characteristics	Advanced Testing Method
Black Diamond-Natural or HPHT	10, possibly less	OTL	~3.52 or less	Adamantine to subadamantine	Variable	Usually, varies	Diamond	Slight translucency, irregular surface	Raman
Black Diamond - Irradiated	10	OTL	3.52	Adamantine	Opaque	Sometimes	Diamond	Mirror-like	Raman
Black Moissanite	9.5	OTL	~3.07	Adamantine	Opaque	Weak to Moderate	Diamond	mirror-like, but evenly granular under magnification	Raman
Black CZ	8.5	OTL	5.6	Sub Adamantine	Opaque	Diamagnetic	CZ	Almost Mirror-like	Raman
Black Tourmaline (Schorl)	7	1.62 - 1.652	3.15-3.2	Vitreous	Opaque	No		smooth, vitreous	Not needed
Black Spinel (Ceylonite)	8	1.77+	3.63+	Bright Vitreous	Opaque	Strong	Spinel range	smooth, bright vitreous	FTIR
Blackened Quartz	7	1.54-1.55	2.65	Vitreous	Slightly Translucent	No	QTZ	slight translucency on edges, very dark brown	Not needed
Black Sapphire	9	1.76-1.77	4	Bright Vitreous	Slightly Translucent	Moderate	Corundum	smooth, bright vitreous, partially translucent in some	Not needed