NATURAL BLACK OPAL – ARE YOU ASKING THE RIGHT QUESTION?

A simple and manageable way to evaluate the TREATMENT of black opal with focus on Dyed/Smoked Ethiopian Opal

Note from the President of Opal Association - Paul

I have been concerned for a while about the amount of treated Welo opal being passed off as natural black opal. There are numerous treated Ethiopian opals wrongly listed on the internet. Equally important they are also been sold in Australian retail shops and unfortunately also on the opal fields. I asked Natassa Patel, an honours graduate in gemmology (AIGS Thailand) to research on how to tell if the stone is natural or treated one is on the opal fields and/without access to laboratory testing equipment. I welcome your feedback as to how easy you found it to understand. Thank you.

Natural Black Opal – ARE YOU ASKING THE RIGHT QUESTION?????

A simple and manageable way to evaluate the TREATMENT of black opals

The words NATURAL BLACK OPAL can be sometimes not as clear as we believe it to be.

Is the opal NATURAL – YES.

Is the opal BLACK – YES.

Nowhere in these words tell us if **the black in the black opal** is of natural origin. The market has been flooded with so called black opal in the last few years in the form of dyed/smoked/sugar-acid treated black opal from Ethiopia. The literature on these treatment process is vague and incomplete. The industry is resorting to ad hoc methods to determine the treatment. The aim of this research, analysis and discussion is to help determined if the black in the black opal is the result of man-made treatments and processes.

The correct question to ask is: **IS THE BLACK OPAL TREATED?**

Why ask this question? VALUE. Customers are being duped into thinking they are buying natural UNTREATED black opal from Australia when all they are really buying is most often a crystal opal that has been significantly altered to produce a black body colour. The price difference between treated and untreated black can be as much as 500%.

https://www.gia.edu/doc/WN11.pdf (page 79) presents before and after pictures demonstrating the enormous difference in what originally came from the earth and the end result. Beware, even rough opal can be treated to change body colour from transparent crystal/white to black or a shade there of.

Treated black opal from Ethiopia can cost in the wholesale market about $10 per carat. An untreated black opal that look exactly the same may cost up to $5000 per carat and sometimes more.

SOME BASICS

Black opal in the trade is sometimes referred to as dark body toned stones.

Natural Untreated Black opal predominantly comes Australia but also has been found in Ethiopia, USA, the Czech Republic, Hungary, Mexico and most recently Indonesia.

For the miners, wholesales and traders in the opal industry, the issue of opal that is TREATED to become black being confused with opals that are NATURALLY black is one of upmost importance. Omitting the truth in this case is as good as lying. People who are in the market of buying opals are being taken advantage of through misinformation and lack of knowledge of what questions to really ask.

Some may say that TREATED black opal has its place in the market. I, personally and most suppliers of opal agree. However it imperative that its market share is not based on false and misleading information.

The aim of this report is to deal with the following issues:

1. Understand that a NATURAL black opal may TREATED to change the body colour of the stone from transparent to black. The key phrase to keep in mind is UNTREATED natural black opal.
2. Giving people who may be inexperienced in black opal some guidelines and techniques to recognise and distinguish between treated and untreated black opal.
3. In the least be cautioned that body colour of a black opal may be a complete and direct result of treatments.
4. A prominent lab may not be available on or near the field/marketplace when opals are purchased.
5. A black opal stone may not warrant the fee that prominent labs charge to check for treatments.
6. There may be no access to larger gemmological equipment such as a microscope, UV spectrometer etc.

Figure 1 – sample stones seen with the naked eye.

Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
UNTREATED -Ethiopian opal	TREATED- Ethiopian opal (dyed/smoked)	TREATED - Ethiopian opal (dyed/smoked)	TREATED - Ethiopian opal (dyed/smoked)	TREATED -Ethiopian opal (dyed/smoked)

Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
UNTREATED - Ethiopian opal	UNTREATED – Indonesian opal	UNTREATED - Indonesian opal	UNTREATED - Ethiopian opal	UNTREATED - Australian opal

Sample 11	Sample 12	Sample 13	Sample 14	Sample 15
UNTREATED - Australian opal	UNTREATED - Australian opal	UNTREATED - Australian opal	UNTREATED - Australian opal	TREATED - Ethiopian opal (dyed/smoked)

A sample of 15 stones were tested in simple (on field) ways to come up with ideas on how to detect the treatment of natural black opals. You can find the results at the end of this report in Appendix A. The samples included black opals (treated and untreated) from Australia, Ethiopia and Indonesia. Please note that gemmological tests diagnostically prove that all 15 sample are NATURAL.

The tests conducted use simple tools that one may carry with them or have access to when purchasing gems such as

- Torch
- Scale
- Neutral coloured vessel with water
- Loop/visor
- Pen/pencil
- Piece of bendable wire or string

SUMMARY OF DETECTING TREATED BLACK ETHIOPIAN OPAL

- UNTREATED black/dark Ethiopian opal body colour was not black at all. It was more of a very dark brown when observed under light and loop.
- Untreated opal from all origins included stones that were opaque (not able to see through it) or semitransparent (there lack of COMPLETE transparency) unlike the dye/smoked treated Ethiopian opal that was completely transparent across the samples.
- Most TREATED black opal from Ethiopian will have deep cherry red transparency when strong yellow light is transmitted close and from below the stone.
- The specific gravity of the treated black opal samples is noticeably lower than the average.
- Indicators of treatment of black opals are more easily visible when immersed in water.
- Most TREATED black opal will show signs of dye/smoke marks indicating that the black in the black opal is NOT of natural origin.
- Use your phone camera to get a closer look at the physical appearance of the stone which can help you to detect treatments.
- Always use white light. It is yellow in colour (to our eyes) and includes the entire visible spectrum of colours which is important to see the true colours of any stone.

Black opal is one of the rarest gemstones on earth. Begin with be caution

- When the stone is highly domed
- When the stone is colour through and through (the play of colour is visible on front/back and down the sides of the stone.

The combination of the high dome and full colour is extremely rare in natural UNTREATED black opal.

Conclusions reached through analysis of test results

1. **BODY COLOUR AND MATRIX VISIBILITY WITH LIGHT AND LOUPE**

    a. For natural UNTREATED black opal strong light and loupe will show that the body colour is NOT really black. It's generally very dark brown or grey. If you are distracted by the colours, concentrate on a spot with no or least amount of colour.
    b. All untreated "black opal" samples had some part of the matrix (host rock or colourless/common opal) and inclusions. The difference in hardness of matrix and coloured opal is quite significant and treatment can result in fracturing of the stone.

*BECOME CAUTIOUS IF THE BODY COLOUR IS JET BLACK AND THERE IS A **COMPLETE** LACK OF MATRIX*. Please note that presence of matrix does NOT mean that it is NOT treated (some treated black opal may have matrix). Samples 3 and 5 in Figure 1 are good examples of how the body colour can be jet-black.

2. **CHANGE IN BODY COLOUR OF STONE WHEN USING TRANSMITTED LIGHT (TORCH LIGHT SOURCE FROM BELOW)**

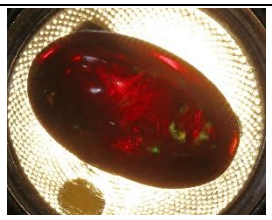
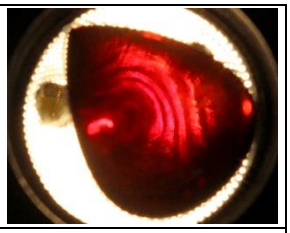
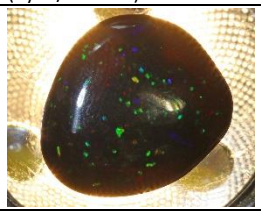
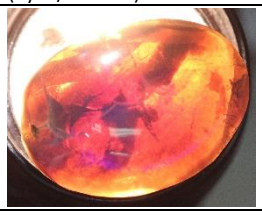
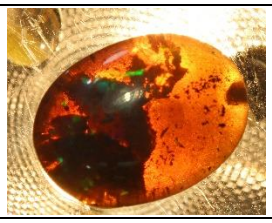
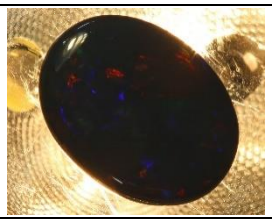
    This test is quite simple and can be a starting point to determine if you should become cautious about the source of the black in the black opal. Use a touch with white (**yellow in colour** and includes the entire visible spectrum) light. The torch and the stone be as close as possible. View the stone from all sides (flip it to have the back of the stone facing upward). A good test for stones that are small in size.

    a. The body colour in ALL of the treated Ethiopian samples became completely transparent (see through) when observed with transmitted light - light source (torch) from below.
    b. More importantly was the **shade of transparent colour** visible - a **distinct cherry red**.
    c. Other naturally black/dark opal (when transparent) display a more yellow/grey transparent body colour.
    d. All untreated samples were only partly transparent and in most cases completely opaque.

*BECOME CAUTIOUS IF THE TRANPARENCY OF THE OPAL CHANGES **CHERRY RED** WHEN LOOKING WITH LIGHT SOURCE FROM BELOW.*

The differences in colour of transparency is quite obvious from photos below.

Figure 2 – transparency with transmitted light

				
Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
UNTREATED -Ethiopian opal	TREATED- Ethiopian opal (dyed/smoked)	TREATED- Ethiopian opal (dyed/smoked)	TREATED- Ethiopian opal (dyed/smoked)	TREATED- Ethiopian opal (dyed/smoked)
				
Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
UNTREATED -Ethiopian opal	UNTREATED - Indonesian opal	UNTREATED - Indonesian opal	UNTREATED -Ethiopian opal	UNTREATED - Australian opal
				
Sample 11	Sample12	Sample 13	Sample 14	Sample 15
UNTREATED - Australian opal	UNTREATED - Australian opal	UNTREATED - Australian opal	UNTREATED - Australian opal	TREATED- Ethiopian opal (dyed/smoked)

3. SPECIFIC GRAVITY TEST

Specific gravity measures of the weight of the stone relative to the size of the stone. All gemstones have differing specific gravities and this test is used habitually in all gem laboratories large and small.

The formula is

$$SPECIFIC\ GRAVITY = \frac{weight\ of\ stone\ in\ AIR}{(weight\ of\ stone\ in\ AIR - weight\ of\ stone\ in\ WATER)}$$

Weight of stone in air – weight as you normally would

Weight of stone in water – stone must be fully immersed and suspended in water. Be sure to ZERO out the water and the items (e.g. pencil and bendable wire) used to suspend the stone in water.

The specific gravity of opal is an average of 2.12 with a range of (1.75 to 2.23). The samples of treated Ethiopian black opal consistently yielded numbers closer to the bottom end of the scale (see Appendix A). They all yielded results well below the 2.12 average. ALL Ethiopian treated opal yielded S.G. closer it the 1.75 mark and ALL the untreated black opal yielded S.G. closer to the 2.0 mark.

There are many Do It Yourself resources on the web to construct a specific gravity kit. Respectable gem testing equipment manufactures also kits for sale at a reasonable price. Use a carat scale that is readable to at least 0.01 carats (2 decimal points) and has a resolution of at least 0.01 carats (accurate to .01 of a carat).

*BE CAUTIOUS WHEN SPECIFIC GRAVITY OF THE STONE IS CLOSER TO **1.75** THEN TO 2.12.*

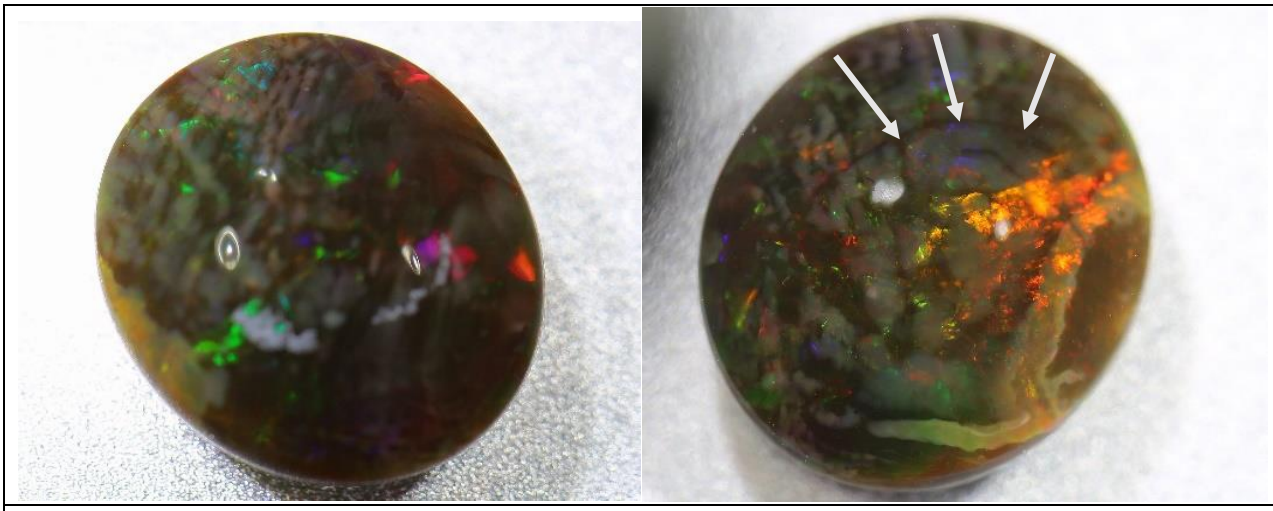
4. DUNK IT – THE "IMMERSION WAY"

Completely immersing the stone in water in a neutral coloured container definitely makes the task of judging treatment much easier. It may not be fool proof but its close.

Dye and smoke marks (black colour concentrations) become more visible. Be sure to look at the stone under water and with strong white light **immediately** with the aid of a loupe/visor. Sometimes the marks that diagnostically confirm treatment seem to disappear the longer the stone is sub-merged. The body colour becomes darker (black becomes blacker) and therefore the play of colour appears stronger which results the marks not standing out as much.

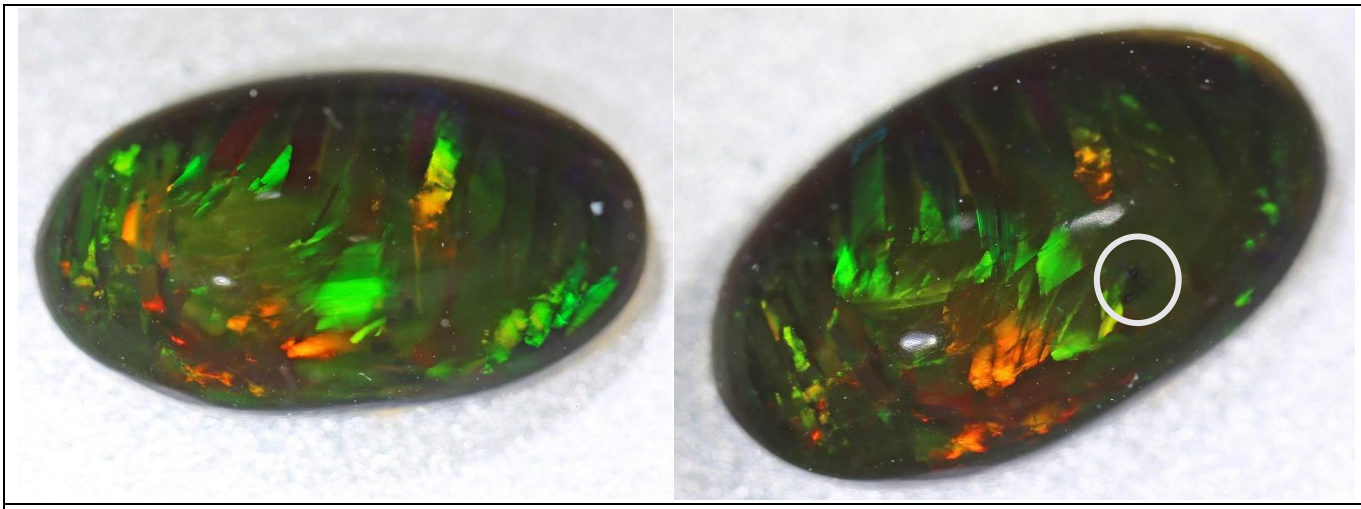
The immersion and strong light technique also helps to highlight the true body tone of the stone. The following images and explanations will give some indications of what to look for.

Figure 3 – Natural UNTREATED Ethiopian opal



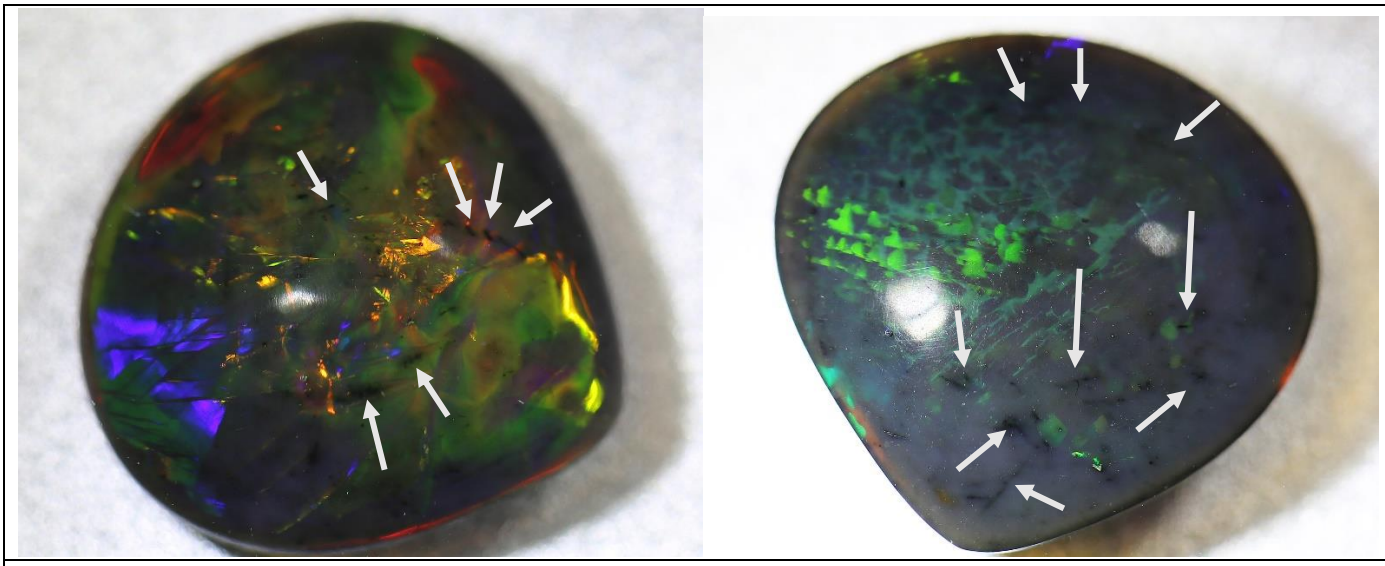
Sample 1
At closer inspection - the body colour is not as black as it first looked with the naked eye (Figure 1)
Be sure not to confuse natural weblike inclusion from smoke/dye concentrations marks.

Figure 4 – Treated dyed/smoked Ethiopian opal



Sample 2
Sometimes the dye/smoke marks concentrations are not always easy to see. The marks tend to be appear randomly patterned. Use the other ways outlined in this article to come to an educated decision.

Figure 5 – Treated dyed/smoked Ethiopian opal

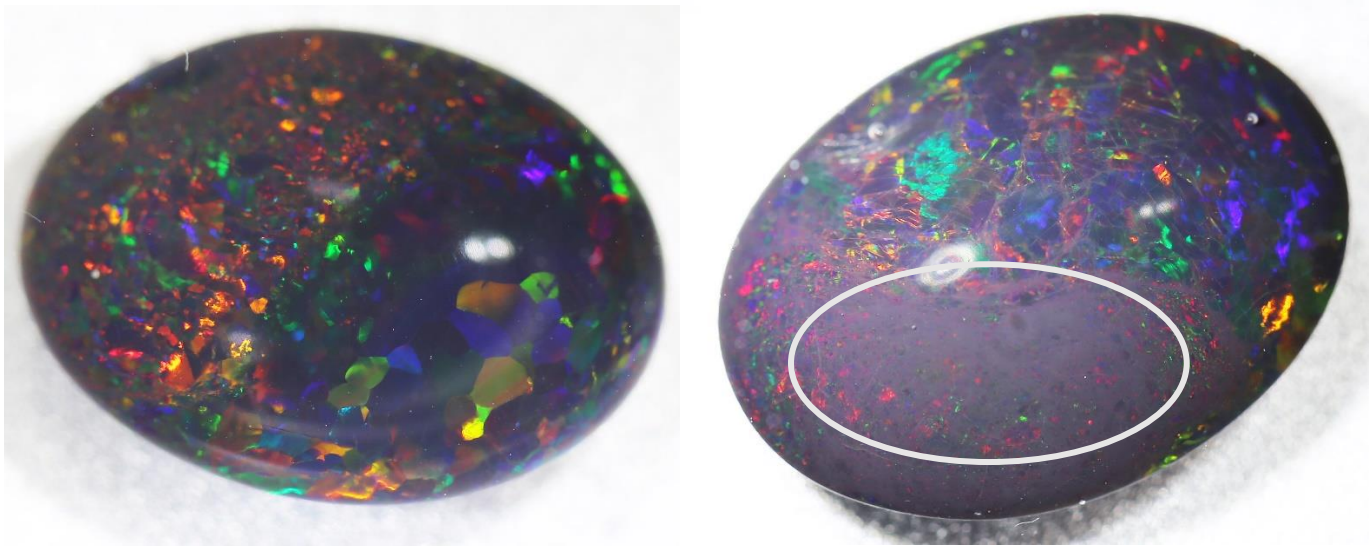


Sample 4
Be sure to see the back of the stone as well.
In this sample evidence of treatment is obvious (left picture – front of stone/right picture – back of the stone).
This sample is a very good example of what most dye/smoke concentrations look like.
These types of marks are not typically seen in UNTREATED black opal.
The dye/smoke concentrations often look like burn marks on wood.

Figure 6 – Treated dyed/smoked Ethiopian opal

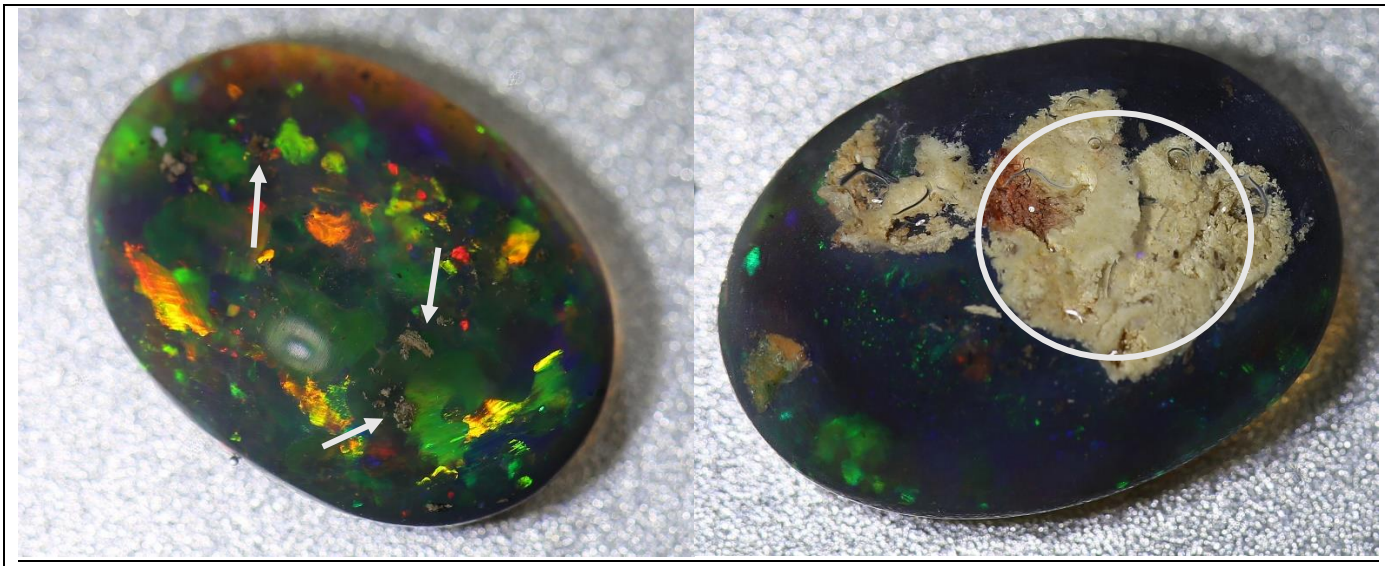
Sample 5
Sometimes stones exhibit a patchy areas of dye/smoke concentrations.
Again this sample shows areas of treatments on the face of the stone.
As mentioned earlier please be sure to check the back of the stone as a lot of the time these dye/smoke concentrations are more easily visible.

Figure 7 – Natural UNTREATED Indonesian black opal



Sample 8
This UNTREATED black opal shows colour visible of front and black but unlike sample 5 (dyed black opal) it show no dye/smoke concentrations, only potch inclusions
Some matrix like inclusions are also visible however coupled with the "true body colour" and lack of dye/smoke marks warrants the conclusion that the stone is untreated.
When compared to the naked eye view of the stone (Figure 1), the body colour is not as black as it seems. Body colour of natural UNTREATED black opal tend to have a brownish or greyish tinge to it when immersed in water and observed with a strong light source

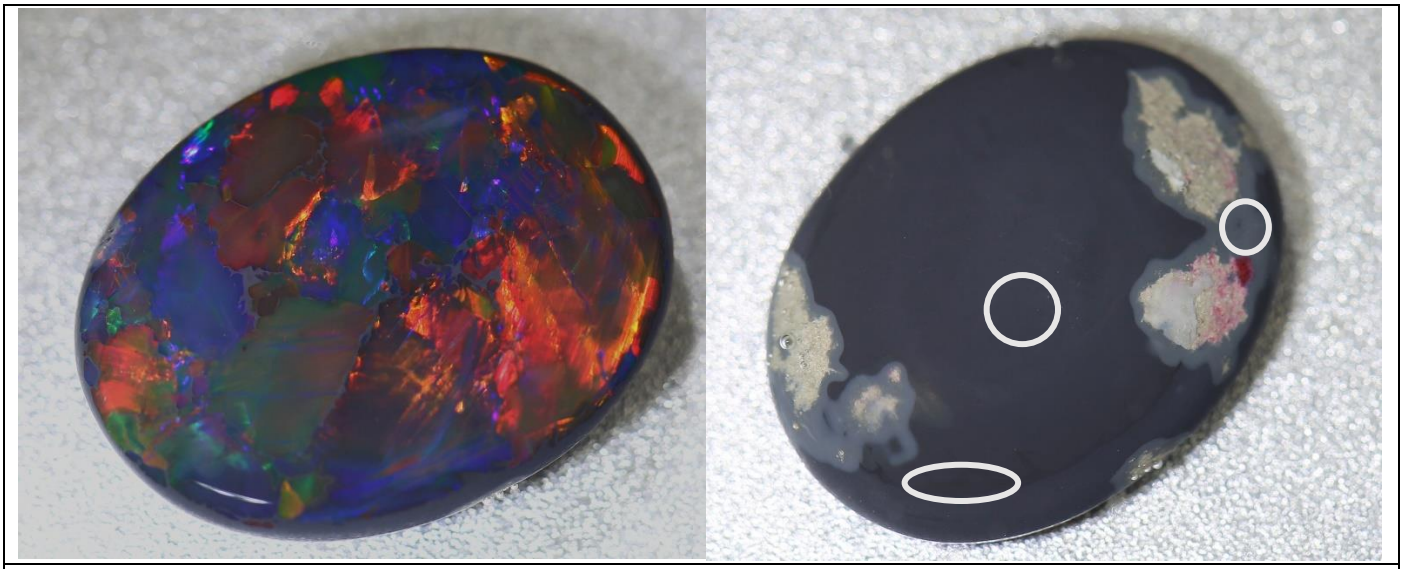
Figure 8 – Natural UNTREATED Australian black opal



Sample 12

This Lightning Ridge, Australian black crystal opal has natural sandy matrix inclusion. The back shows the sandstone matrix that you sometimes find with Australian UNTREATED black opal. Note the colour of the matrix and use it as an indication of determining if the stone is treated. The appearance of these inclusions are noticeably different from the dye/smoke concentrations of TREATED black opal.

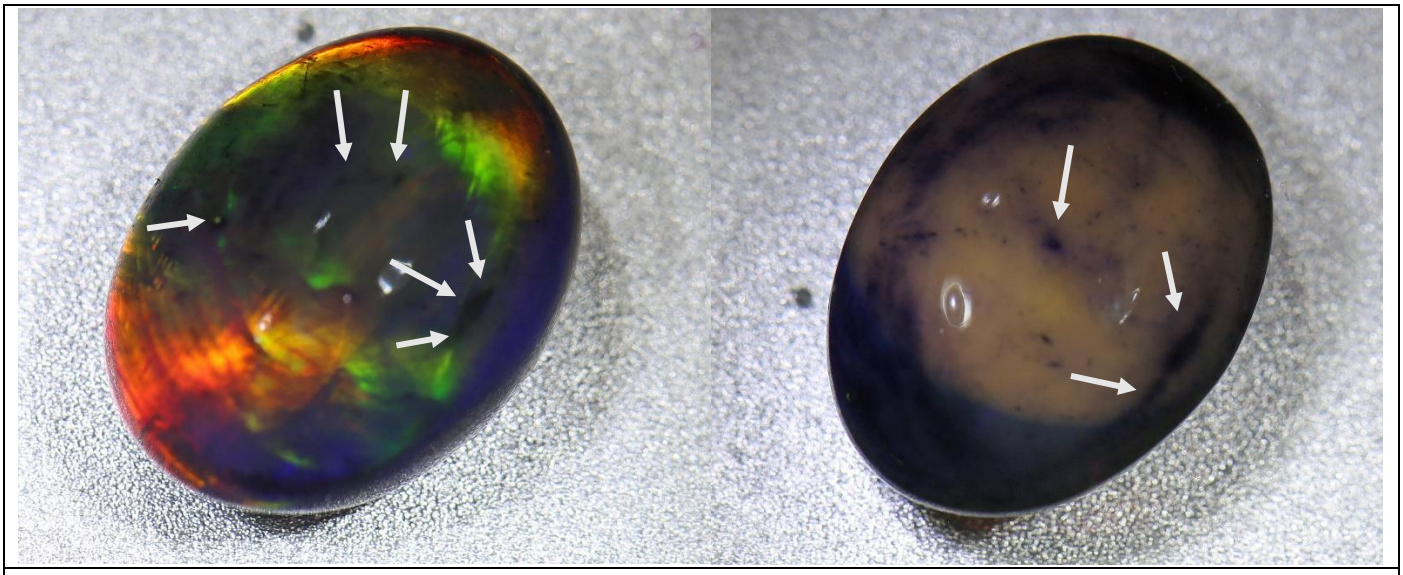
Figure 9 – Natural UNTREATED Australian black opal



Sample 13

UNTREATED black opal from Australia - back of the stone (right photo) shows "potch" which is very typical of natural untreated opal that comes the famous Lightning Ridge field. Potch is "what precious opal is formed on. It can be grey, black or even white in colour. The majority of common opal mined is called **Potch**, so it is basically common opal with no colour. **Potch** is a hydrated amorphous form of silica and is known as a mineraloid. *(https://www.opalauctions.com/learn/did-you-know/what-is-potch-and-what-colors-is-it).* Untreated black opal from Australia will almost always have this potch. Generally it appears on the back of the stone and will vary in its blackness. Note the differing shades of black potch.

Figure 10 – Natural dye/smoke treatment Ethiopian opal



Sample 15
Natural TREATED Ethiopian opal – sometimes the dye/smoke marks are obviously visible on the front and the back of the sample. Unlike the different shades of potch shown in Figure 9, the colourless parts of this stone looks the part of "FAKE". This appearance of bleeding colours is NOT typical in UNTREATED black opals.

5. YOUR PHONE CAMERA (Marco lens optional)

The cameras on phones nowadays are well equipped to take zoomed in pictures. Macro lens adapters for phones are available and affordable. It can give the extra edge needed to examine the stone close-up so that informed decisions can be made about treatment.

The best photos are taken with zoom feature while maintaining a few centimetres distance from phone to stone. Be sure to immersed the stone in water and have strong light close to the stone itself. Remember the longer the stone is immersed in water, the less visible the dye/smoke marks.

If there is a hefty price attached to the stone and confusion about treatment remains, it is recommended that a gemmologist opinion is take into consideration. Remember that not all labs are created equal. Black opal is a rare stone and many labs do not have enough experience with it. It is best to make sure the request for detecting treatments is SPECIFICALLY made and addressed in the certificate.

Gem labs are an important part of the industry but many a times their place just seems a little out of reach. The test methods outlined in this report helps to bridge that gap. For those who are out in the fields, travelling and buying this article gives relatively easy and accessible ways to evaluate the treatment of black opals from all sources. The Ethiopian black opal question is addressed to a greater extent in this report as it is the current concern causing confusion in the market. The gem industry is forever evolving with new finds, new treatments and new demands and customer confidence can only be maintained and increased through cooperation of knowledge and accurate information dissemination. With easy access trading around the world, being at a specific location does not 100% that the opal being sold is of that origin. On several occasions dyed/smoked Ethiopian opal has been offered as Lightning Ridge black on the fields of the mining town in Australia. The treated Ethiopian black opal has reach all localities which produce untreated black opal including Australia, Mexico and Indonesia. Find trusted suppliers and use this study as a guide to assist in recognising the signs of TREATED (dyed/smoked) black opal.

Buying black opal on the internet

With the exception of the specific gravity test, suppliers can be requested to provide photos of black opal available for sale outlined in this report. Included in your request should be:

- Close up photos of stone immersed in water.

- Photos of front and BACK of the black opal.
- Photo of black opal with transmitted light.

In summary:

Be alerted when:

Closer inspection of the stone reveals that the body colour is JET BLACK and lacks matrix and potch.

The transparency of the stone with transmitted YELLOW light is a deep cherry red colour.

The specific gravity of the stone is closer to the minimum range of 1.75.

While the stone is immersed in water (aided with strong light source and loupe/visor) distinct dye/smoke marks become apparent almost immediately.

These test collectively can diagnostically prove that **the black on the black opa**l is NOT of natural origin.

Advisable Notes

Immerse the stone fully in water to make it easier to see evidence of treatment.

Utilize the zoom function on phone to get clearer and focused pictures of areas of stones that show evidence of treatment.

Construct or purchase a portable specific gravity kit.

Purchase a torch with “white light” (full spectrum and is yellow in colour).

ABOUT ME

I have being around Australian opal since my teens. After graduating my MBA I joined the family business and for the just over 16 years have been trading and selling opals in cut and rough around the world. Recently I completed my accredited gemmology program for the Asian Institute of Gemmological Studies (Thailand) giving me a unique perspective to combine trade experience with the scientific world of gems, specifically opals. Bridging the gap between the gem labs and the traders of gemstones is my main priority with the establishment of my gem certification and consulting services on the Gold Coast. My objective is to create resources and give humble insight into issues that will improve the industry as a whole with key emphasis on increasing consumer knowledge and information. As a member of the following associations I can pool together my learned experiences and those of others:

The Opal Association, Gemmological Institute of Australia, Jewellers Association of Australia, International Coloured Stone Association and the Jewellers Vigilance Committee.

Any comments and queries can be directed to info@gemcertify.com.

APPENDIX A - TEST RESULTS

	Carat Weight	Specific Gravity	Immersion (2mins)	10x
Sample 1	12.80 cts	2.030	no change	no pitting
Sample 2	13.33 cts	1.786	black gets blacker/colours get brighter	pitting/black spots
Sample 3	9.43 cts	1.769	black gets blacker/colours get brighter	burn marks (lines/spots)
Sample 4	11.23 cts	1.694	black gets blacker/colours get brighter	burn marks (lines/spots)
Sample 5	20.76 cts	1.689	black gets blacker/colours get brighter	pits
Sample 6	24.30 cts	2.018	no change	nicks/scratches
Sample 7	8.91 cts	1.991	no change	smooth surface
Sample 8	8.89 cts	2.012	no change	nicks/scratches
Sample 9	5.33 cts	2.033	no change	smooth surface
Sample 10	47.05 cts	2.114	no change	smooth surface
Sample 11	7.63 cts	2.127	no change	matrix
Sample 12	5.81 cts	2.720	no change	matrix/webbing/dendritic inclusions
Sample 13	6.65 cts	2.090	no change	matrix/ webbing
Sample 14	3.71 cts	2.098	no change	inclusions
Sample 15	6.28 cts	1.853	black gets blacker/colours get brighter	black spots/indentations

		Transmitted Light (light from below)		10x with reflected light (immediate reactions) immersion (light as close to stone as u can get)
Sample 1		orange	semi transparent	inclusions - webbing
Sample 2		cherry red	transparent	dye/smoke marks visible
Sample 3		cherry red	transparent	dye/smoke marks visible
Sample 4		cherry red	transparent	dye/smoke marks visible
Sample 5		cherry red	transparent	dye/smoke marks visible
Sample 6		dark brown	opaque	no burn/dark spots visible
Sample 7		dark brown	transparent	no burn/dark spots visible
Sample 8		dark brown	opaque	no burn/dark spots visible
Sample 9		grey/brown	transparent	no burn/dark spots visible
Sample 10		black/grey	transparent	no burn/dark spots visible
Sample 11		yellow/orange	transparent	no burn/dark spots visible
Sample 12		yellow black	transparent	natural inclusions- dendritic/sandstone
Sample 13		grey black	near opaque	natural inclusions - potch, sandstone, matrix
Sample 14		orange	transparent	natural inclusion - webbing
Sample 15		cherry red	transparent	dye/smoke marks visible

REFERENCES (make sure your research is from reliable, experience resources)

https://www.gia.edu/gems-gemology/spring-2016-labnotes-hydrophane-opal-treatment

http://www.stonegrouplabs.com/SmokeTreatmentinWolloOpal.pdf

https://www.gia.edu/gems-gemology/winter-2014-gemnews-new-deposit-black-opal-from-ethiopia

https://www.gia.edu/gems-gemology/fa13-ln-technique-hydrophane-opal