Typical Characteristics of Fluorite from Famous Localities II

(How to recognize and value your fluorite and its relatives)

FLUORITE WITH SELECTIVE ETCHING, XIA YANG, FUJIAN PROVINCE, CHINA

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Introduction

As we discussed fluorite value factors, there were some great questions that came up, and I would like to address these briefly before continuing with distinctive fluorite localities.

Cleavages and Fractures

Planes: Many minerals have cleavages in stereotypical directions, while others have none and only fracture. Minerals that cleave can also fracture especially in directions not relating to their structural weakness planes or if there is specific, localized trauma. Cleaves are in planes and often travel from one edge to the other. They can split off or they can remain as a defect within the crystal. An excellent example of cleavage is muscovite mica. These form flat booklets that literally peel away from each other. Fractures tend to have irregular boundaries and can appear conchoidal or hackly. Quartz is an example of a mineral that has no cleavage planes.

Figure 1. This mica has booklets that can be seen stacked on the front edge. In the back, one such elongated book has been peeled off and bent upward. On the very top left corner is also a fracture, where there is damage that is not a cleave (red circle.)

Cleavage in Fluorite: Fluorite is somewhat unique in that it has 4 perfect planes of cleavage (more than most minerals.) These are all on the octahedral plane, which means that a cube of fluorite can have all its corners knocked off (cleaved off) to leave an octahedron. This is not a naturally formed crystal habit octahedron like we have been discussing, but rather a shape created by exploiting its cleavage planes.

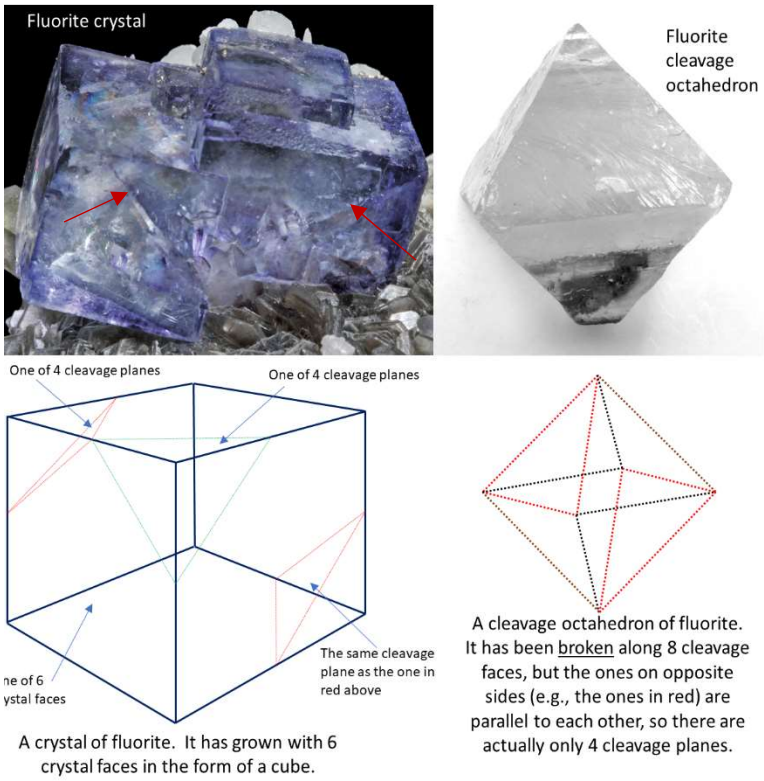

Figure 2. The purple cubes in the upper left show internal cleavage planes (red arrows). The white piece is a cleavage product produced by forceful sharp trauma as described in the lower drawings

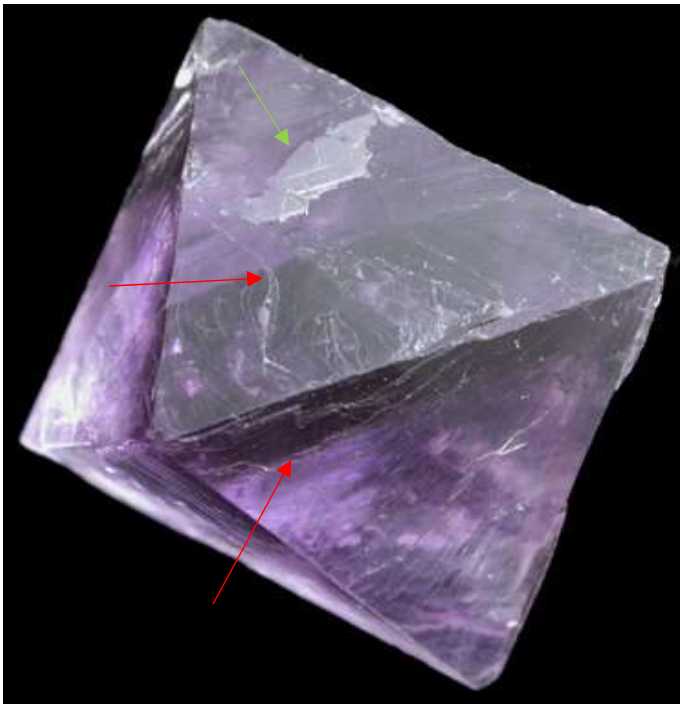

Figure 3. This is a fluorite cleavage product. Notice that there are no crystal growth details. Note the curved to swirling marks (red arrows) where microlayers have been lifted off each other. Notice also the rainbow iridescence of a lifted area near the top (green arrow.) John Betts photo and specimen.

As fluorite cleaves, it does so imperfectly. It switches micro planes and leaves behind tiny step-offs which look like swirl lines. Also, as one plane lifts up, it can sort of pull up another layer that remains behind creating an air interference pattern which can look whitish or rainbow iridescent. It also can have a metallic or mother of pearl look. Under magnification, you may be able to see the actual step-offs of the cleaved planes themselves. A natural crystal will have cubic habit forms on its surfaces called hillocks or crystal growth details. I use tangential lighting and magnification if it is difficult to determine whether a crystal is cleaved, fractured, recrystallized, or natural.

Figure 4. Each octahedron shows dramatic smaller octahedral growth structures on the crystal faces. Akchatau Mine, Kazakhstan. Wolfgang Wendel photo, my specimen.

Selective Etching, Selective Color:

Etching and Selective Etching: Crystals not only grow but can be resorbed also. This process can be carried out by a partial return of the hot hydrothermal fluids that created the fluorite or by natural acids created from meteoric water, sulfides, carbonates etc. This process is on a continuum from creating a "melted" look on a crystal that still retains its overall habit (mild) or to a really distorted glob (medium) or to where the fluorite is completely gone (severe- often a pseudomorph or a contact within another mineral). Because of chemical and electromagnetic properties of the components of crystals, this process may affect some areas over others- this is called selective etching. The photo on the title banner shows selective etching (texture) on the bevels (the 6 sided dodecahedral faces) while the cubic face remains smooth and unetched.

Figure 5. Fluorite with selective etching and selective color. The bevels are magenta and etched, while the cubic faces are blue and smooth. La Collada Mine, Asturias, Spain. Crystal Classics photo and specimen. (Also, can you see the cleave?)

Figure 6. Heavily etched fluorite without any remaining crystal habits or distinctive faces (like a candle after burning.) Elmwood Mine, TN, USA. Dan Weinrich photo and specimen

Figure 7. Quartz Pseudomorph Fluorite. There is no remaining fluorite on this piece. The crystalline quartz has more resistance to acids and melting or dissolving, therefore the quartz remains while the fluorite is completely gone, leaving only cubic impressions within the hexagonal quartz. In fact, I am unable to find any pieces of fluorite from this rare locality, so it is unknown what the original fluorite even looked like, except that it made isolated cubes. Yew Tree Mine, Weardale, County Durham, England.

Selective etching or stepped growth can make determination of the luster more difficult. If the bevels are only etched, then the luster is characterized by the smooth faces. Etched pieces are highly popular as are stepped growth pieces, even though both of these things can break up the light and look rougher than smooth faces. Etching can also lead to deep cracks within the fluorite, so something else to look for on pieces. The fluids ran down and into the cracks, so there will be etching inside and along these cracks. Therefore, they can be distinguished from cleaves or mishandling damage.

Twinning in Fluorite

Interpenetrant Twins: There are two main types of twinning that fluorite takes. The most common type is interpenetrant (aka penetrant twin) twinning where the twin occurs on an internal plane within the crystal. These are easy to identify as they still have a pretty obvious cube form with corners sticking out.

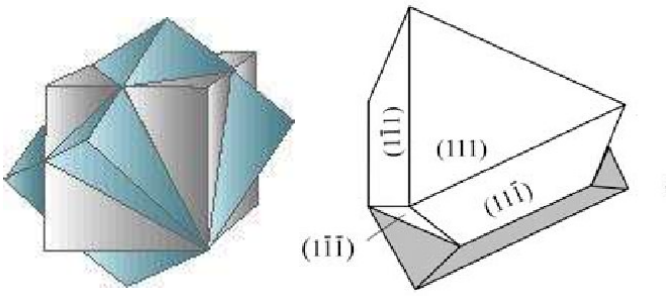

Figure 8. Interpenetrant twin on left, Spinel law twin on right. The parts of one crystal twin are in gray while the other twin is in blue or white respectively

Figure 9. Interpenetrant Twin. Hilton Mine (Dowscar High Level), Eden, Scordale, Cumbria, England

Spinel Law Twins: The rarer type of fluorite twinning is called the spinel law twin where the twinning occurs as a contact on an outer edge of the crystal (not internally as before.) The two sides of the twin can keep the same orientation or be rotated upside down. Often, they will be flattened on one axis with a rounded or pseudohexagonal form on the other two.

Figure 10. Spinel Law Twin. Erongo Mountains, Karibib, Erongo Region, Namibia

Figure 11. Another spinel Law Twin. Erongo Mountains, Karibib, Erongo Region, Namibia

Emerald Green Fluorite Twins of Weardale, England:

Rogerley Mine, Frosterley, Weardale, County Durham, England which became the Diana Maria Mine and the Lady Annabelle Mine in 2017

Eastgate Cement Quarry, Weardale and Heights Mine, Weardale also produce similar specimens

Although there are many small mines from Weardale, the most famous is the Rogerley Mine which was worked by Cal Graeber and Jesse Fisher until 2017 when this was taken over by Ian and Diana Bruce. Their website has very detailed write ups and many pictures, so I am not going to redo all the work here. I highly recommend this site: **UKminingventures.com**

Fluorite from here is daylight fluorescent, and the term "fluorescent" was named from "fluorite" as people could see the effect in the daylight without the UV lights we use today. About 95% of fluorite from Weardale is daylight fluorescent and the phenomenon is rare from other locations (outside of smaller areas in England.) Typically, pieces from here are bright greens and small cubes that show interpenetrant twinning. Many specimens have white inclusions that spread up and out from the base, but the best quality shows gem clear cubes. Many cubes here can be elongated to rectangular and many have bizarre line patterns on their surfaces. Rarely, other colors were found – deep purple, cognac to orange, sunny yellow, and mauve and blue. Distinct phantoms are rare here but do occur and are highly sought.

Figure 12. Interpenetrant twins of Rogerley Mine fluorite indoors, with uncommon purple and white phantoms

Figure 13. Interpenetrant twins and concentric lines on surface of center large crystal. Purple indoor color. Frazier's Hush Mine, Rookhope, Weardale, County Durham, England (Unknown attr)

Figure 14. Interpenetrant twins of Rogerley Mine fluorite indoors. Note the white inclusions in most of the cubes (red arrows.)

Figure 15. Same piece as Figure 14, this time exposed to daylight. The white inclusions are more obvious in this light

Figure 16. Large cabinet piece of Eastgate Cement Quarry, Weardale

Perfect Gem Clear Fluorite of Dalnegorsk, Russia:

2nd Sovietskii Mine, Dalnegorsk, Primorskii Kray, Russia

Nikolaevskiy Mine, Dalnegorsk, Primorskii Kray, Russia

Not gemmy, but pure gem crystals of fluorite are famous from Dalnegorsk. The best are perfectly clear and range from simple cubes to modified cubes to complex beveled cubes (or even more complex.) They are so perfectly formed that many of the best are optical, where they shoot rainbow reflections in bright light or sunlight. They are most often on a calcite and goethite embedded sedimentary matrix and are sometimes associated with clear quartz prisms. Often, the matrix can be seen through the crystals or even magnified by it.

Figure 17. Cubes modified by the dodecahedron with optical effects caught in the photo in the upper left cube. Tony Peterson photo and specimen, taken from Mindat "photo of the day"

Figure 18. Perfect cube modified by the dodecaheron (bevels.) Note the subtle selective etching of the bevels and the matrix seen through the crystal (red arrow.) Boris Kantor specimen and photo

Figure 19. Perfect simple cube on iron oxide stained matrix. Y. Okazaki specimen and photo

Figure 20. Perfect simple cube magnifying the goethite and calcite covered quartz on which it is attached. Jordi Fabre specimen and photo

Bold Color Zoning of Fluorite from Namibia

Erongo Mountains, Karibib, Erongo Region, Namibia

Fluorite from Namibia is bold, complexly formed and color zoned with contrasting bright colors, including black. The most famous of these are the 2007 find of "alien eye" fluorite which cuboctahedrons of black with prominent green cube phantoms resembling eyes. Namibia is also one of the two areas known to produce spinel law twins (see page 3) with the other being pink twins from Pakistan. Okorusu has a high variety of colors, contrasting in bold zones.

Figure 21. Alien eye fluorite. Hershel Friedman specimen and photo

Figure 22. Alien eye fluorite on quartz. Martin Gruell specimen and photo

Okorusu, Otjiwarongo, Otjozondjupa Region, Namibia

Figure 23. Magenta, white, and yellow fluorite

Figure 24 (above) and Figure 25 (below) A hot mess of colors and shapes. Okorusu, Nami