# Fluorescent Minerals: Chris Wallage for LMS Oct 2023

The first person to describe the phenomenon of rocks glowing in the dark under ultraviolet light was Sir George Stokes, 1st Baronet (1819-1903). He was a physicist and mathematician at Cambridge.

In 1852 he conducted experiments with fluorite under ultraviolet light and because he was working with fluorite, he called the optical effect Fluorescence. This, along with his many other scientific accomplishments earned him the position of President of the Royal Society and Master of Pembroke college Cambridge. He was a true polymath, a person with expertise spanning a wide range of subjects.

There are 5,000 known minerals of which around 10% (500) are Fluorescent. That is, they respond with colour under Ultraviolet light.

A suitable UV light is needed. Minerals may respond to some or all UV Wave Lengths, often emitting different colours.

UVA is Long Wave 365nm.

UVB is Medium Wave 311nm

UVC is Short Wave 254nm.

UV Band Pass glass filters are essential and work by screening out non UV Wavelengths, whilst transmitting the UV and a small amount of IR.

**These are popular Fluorescent Minerals.**

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|---|---|---|
| Andersonite | Apatite | Aragonite |
| Autunite | Axinite | Barite |
| Borax | Celestite | Cerussite |
| Chalcedony | Colemanite | Corundum |
| Eucryptite | Feldspar | Fluorapatite |
| Fluorite | Hardystonite | Hyalite |
| Hydrozincite | Scapolite | Scheelite |
| Selenite | Sphalerite | Tremolite |
| Tyuyamunite | Ulexite | Willemite |

To emit Fluorescence most minerals depend on some form of impurity that acts as an activator. Including the rare earth elements, there are over 30 different common Ions and Elements that can cause fluorescence.

**Trace Elements Activators**

The vast majority of activators are atoms of certain metal elements which become part of the minerals chemistry by taking the place of atoms in the host mineral. When the electrons in a responding mineral shift to a higher orbit they can't stay there indefinitely. They are constantly shifting with blinding speed between their normal position

and a higher orbital as the ultraviolet energy continues. Even though the electrons are shifting the colour we see is steady.

A few minerals can fluoresce without Trace Elements help and are considered self-activators.

**Self-Activating Minerals**

Self-activating minerals use their own electrons to absorb ultraviolet enerey giving their electrons the energy to shift away from the atoms nucleus to the next higher energy level. The remaining light energy is out of balance and reemitted and can be seen as a visible colour.

Ultraviolet energy is not visible so what you see is the lower magnetic energy level resulting from the action of the activator.

**Associated effects.**

*Phosphorescence* also known as “after glow” where light continues to be emitted usually for seconds but can be for days.

*Tenebrescence* where the specimen actually changes colour on exposure and can then be changed back by using a different UV wavelength or daylight.