



## What is Fluorescence?

The fluorescence phenomenon has been observed for thousands of years and was mentioned in Chinese books as far back as 1500 BC.

Several hundred years ago, Johann W. von Goethe described fluorescent light phenomenon in his Theory of Colors. He asked his readers to: "... dip a fresh piece of horse chestnut bark into a glass of water; the bark will immediately turn sky-blue." However, only today do we truly understand this phenomenon and have the ability to control and make use of its processes.

Fluorescence is a special form of luminescence, an optical phenomenon in cold bodies, in which a molecule absorbs a high-energy photon, and reemits this light at a lower-energy or longer-wavelength. The term fluorescence is named after the mineral calcium fluoride, which has been seen to exhibit this phenomenon.



The energy difference between the absorbed and emitted photons is released as molecular vibrations (heat). Usually the absorbed photon is in the ultraviolet part of the spectrum, and the emitted light (luminescence) is in the visible range, but this depends on the absorption curve and Stokes Shift of the particular fluorophore. The Stokes shift, so named after the Irish physicist George G. Stokes, is the difference (usually in frequency units) between the spectral positions of the band maxima (or the band origin) of the absorption and luminescence arising from the same electronic transition.

Generally, the luminescence that occurs at longer wavelengths than the absorption is stronger than those at shorter wavelength. The latter may be called an anti-Stokes shift. Each fluorescent material has its own unique value, basically a fingerprint that allows the material to be clearly identified.