# Thermoluminescence Encyclopedia Article

## Thermoluminescence

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# Thermoluminescence

Thermoluminescence is phosphorescence of a material due to heating.

Thermoluminescence occurs as a result of high-energy electrons trapped within the material being studied. The electrons are trapped at metastable sites within the mineral lattice of the material. When the material is heated the electrons are freed and this produces light very similar in quantity and quality to that of fluorescence. The amount of light produced is proportional to the **energy** that the material has absorbed as a result of exposure to ionizing radiation. While the mineral is at standard **temperature** and pressure the electrons are trapped inside the mineral and there is no thermoluminescence. The thermoluminescence does not manifest itself until a temperature of 932°F (500°C) is reached. The electrons are released at this temperature and they are able to return to their normal atomic orbits. As they do this photons of light are emitted in the visible spectrum.

A graph plotting light against temperature is called a glow curve and it is characteristic of a given mineral. The amount of light emitted is proportional to the sensitivity of the material and the amount of radiation absorbed. Comparison between the sample under test and a sample with a known amount of added radiation can be made to give an indication of when the sample was last exposed to ionizing radiation (a clock resetting event). A clock resetting event can be heating, so it can be calculated when a meteorite heated up in the atmosphere, or when a piece of pottery was fired, or when some material was burned.

Thermoluminescence is a technique which can be used to date material that has once been heated.