CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
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Project Number
31584

Project Title
Does Temperature Affect Fluorescence in Minerals?

Abstract

Objectives/Goals
This experiment was conducted to determine how temperature affects the intensity of fluorescence in minerals by building an electronic device to measure the intensity of light produced by 5 different minerals: wernerite, hackmanite, calcite, fluorite and opal, with a series of temperature tests(-20C-100C). By tracking voltage changes with a circuit containing a photoresistor,potentiometer,battery,and multimeter,the amount of light can be measured and the affects of temperature in relationship to fluorescence in each can be determined. The level of resistance is altered by light in a photoresistor and measured in ohms.

Methods/Materials
Assemble ultraviolet light box, light-sensing meter and test. Record multimeter reading without specimen in place. Test each mineral sample at 20C(control) by placing under ultraviolet light and sensor, record reading and photograph. Keep placement of each specimen the same for all measurements. Repeat after bringing each sample to determined temperatures by placing in refrigerator(0C),freezer(-20C),heat lamp(40C,60C)and oven(80C,100C) record data and photograph. The responding variable is the amount of luminescence emitted by each specimen.

Results
3 series of tests were conducted using 7 temperatures, for a total of 105 measurement readings. Results were used to compare each specimen's ability to fluoresce at different temperatures. Data from all 3 series was combined to account for any minor variance in the readings. Fluorite ranging from 1.4 at 20C to 1.7 at -20C, a 17.6% change and wernerite with 2.6 at 0C to 3.0 at 80C with a 13.3% change exhibited the most difference in fluorescence. Hackmanite had a moderate change of 4.8%, opal a 3.8% change and calcite had the least reaction to differences in temperature at 3.7%.The degree of luminescence was dependent on the temperature.

Conclusions/Discussion
From this study (105 readings on 5 different minerals), I have concluded that some minerals' ability to fluoresce is both negatively and positively affected by temperature. Changing levels of emitted luminescence were recorded as stated in my hypothesis "If fluorescent mineral samples are exposed to extreme heat and cold, then the degree of luminescence they emit during fluorescence will change slightly." Physical characteristics and concentration of each specimen's activators are clearly important in the degree of impact varying temperatures had on each minerals' fluorescence.

Summary Statement
This experiments light measurement readings from 5 different fluorescent mineral specimens at 7 different temperatures supports the correlation between temperature and the amount of luminescence emitted by a fluorescent mineral.

Help Received
None