Interference Fringes

Objective

The student will observe interference fringes formed by a layer of air between two pieces of glass.

Science and Mathematics Standards

Science Standards

☑ Science as Inquiry
☑ Physical Science

Mathematics Standards

☑ Problem Solving
☑ Communication
☐ Connection
☐ Computation/Estimation
☐ Measurement

Theory

When light of a single color (or wavelength) passes through the layer of air between two flat pieces of glass, part of the light is reflected by the glass-to-air boundary and part is reflected from the air-to-glass boundary. If the difference in the paths of the two rays is equal to a multiple of whole wavelengths, the light amplitude will add to form a bright band. The dark bands are formed by rays that cancel each other. A good source of light that has some single colors is a fluorescent light. The light looks white to your eyes even though it contains a bright green component caused by the mercury vapor in the tube. This is called the mercury green line and has a wavelength of 5,461 angstroms, which is 0.5461 millimeters (0.5461 E–6 meters). See the illustration on page 62.

Materials

- 2 glass flats (glass microscope slides) (see List of Catalogs, page 83.)
- sheet of black construction paper
- a light source such as an overhead fluorescent light
- 1 set high-quality flats (optional) (see List of Catalogs, page 83.)

Procedures

1. Stack the two glass flats one on top of the other. Put the flats on the black construction paper or cardboard provided. Place the flats under a fluorescent light.

2. View the flats at an angle so the fluorescent light can be seen in the reflection as shown below. Observe the interference fringes. They will appear as contour lines or concentric rings that are somewhat irregular.

3. Press on the glass flats with your finger and observe the effect on the interference fringes.

Observations, Data, and Conclusions

1. Were you able to observe the interference fringes? What did they look like?

2. What happens when the glass flats are pressed?

Use of high-quality glass vs. low-quality glass in this experiment

Straight, parallel lines are seen when high-quality glass flats are used.

Uneven, wavy lines are seen when low-quality glass flats are used.