Polarization of Light

Objective

The student will observe polarized light and how it is affected when it passes through stressed transparent plastic materials.

Science and Mathematics Standards

Science Standards

☑ Science as Inquiry
☑ Physical Science

Mathematics Standards

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

Theory

If the electric field of light (a transverse wave) moves in a fixed plane, then the light is said to be polarized in that plane. A polarizer made of film material will pass light in only one plane. If we have two Polarizing filters whose planes of polarization are rotated 90 degrees with respect to each other, then no light gets through. Some materials can rotate the plane of polarization as light passes through them. If we place this material between crossed polarizers, then some light can get through. An example of a material that rotates the plane of polarization is clear plastic under stress. (Stress patterns can be produced by applying a force to the plastic. They can also be generated during the manufacturing process and frozen into the plastic.)

Materials

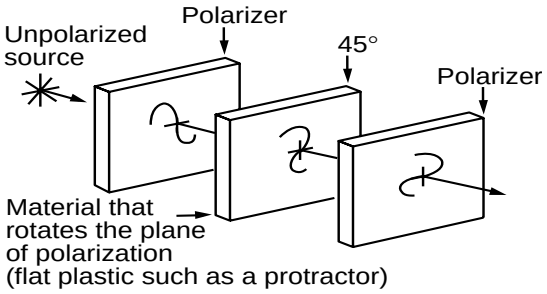
- 2 sheets of Polarizing material for filters
- small metal or cardboard frames
- a light source such as a flourscent light
- samples of flat molded plastic objects such as a protractor
- transparent tape

Procedures

1. Place one Polarizing filter on top of the other filter. Look through both of them toward a light source such as a fluorescent light or a window. Rotate one of the filters with respect to the other one until no light passes through them.

2. Place a flat molded plastic object between the two filters and look toward the light source. Some light will now pass through the two Polarizing filters as illustrated. Observe the pattern of light created by the transparent piece of plastic; note the corners.

3. Using the metal or cardboard frame provided, cover the frame with overlapping layers of transparent tape. Use no more than three layers of tape at any overlapping place on the frame. Place the frame with the transparent tape between the two Polarizing filters. Rotate the filters again so that the light is blocked out and look at the light source.



Observations, Data, and Conclusions

1. Why does light not pass through the two Polarizing filters turned at 90 degrees to each other?

2. Why does light pass through the molded transparent plastic?

3. What effect do the layers of transparent tape have on the light as it passes through them and the Polarizing filters?

Junior Home Scientist

Experiment with polarized light at home. Find an old pair of Polarizing sunglasses and carefully remove each lens from the frame. These two lenses will provide you with two Polarizing filters to use to examine other materials. Corn syrup in water is another material that has the ability to rotate the plane of polarization of light between two Polarizing filters. For best results, the water and syrup solution should be put in a clear container with flat sides.