

Objective: Using the concepts of photolithography, students will transfer a pattern from an acetate transparency to sun paper.

Background:

Photolithography is one process through which very small (can be less than a few micrometers) 3-D features can be produced. It is the basis for manufacturing microelectronic chips used, for example, in computers. The lithography process involves a series of steps that creates successive layers of materials. The process begins with a **substrate**. Silicon is the preferred material. A primer is applied that acts to help bind the next layer, the photoresist, to the substrate. The **primer** is applied, and then the photoresist is layered on afterward, building up on the substrate layer in a sandwich like fashion. The **photoresist** is a chemical that is sensitive to radiation (e.g. light) and whose properties (*i.e.* solubility) are changed when exposed to radiation. The **mask** contains opaque (block radiation) and clear areas (allow transmission of radiation), which allows the radiation to pass through only selected areas to create the desired pattern. The top layer, the photoresist is exposed to radiation using a **mask**, which contains a pattern that is transferred to the top layer.

National Science Education Standard: Science and Technology Standards, Levels 9-12, Abilities of technological design

NYS MST Learning Standard: Standard 1.1, Engineering design is an iterative process involving modeling and optimizations finding the best solution within given constraints which is used to develop technological solution to problems within given constraints.

Materials: sunprint kit (available from Lawrence Hall of Science, www.lhs.berkeley.edu), ink jet transparencies with shapes printed on them, 250 mL beakers or bowls to hold water, SUNSHINE!!!!

Check for prior learning:

What does photo mean? What is lithography? (See above background section.)

New learning:

Students choose a pattern and explain the process they are using to transfer the pattern to the paper. Be sure to check their knowledge of photolithography!

Check for learning:

What is photolithography? What is it used for in nanobiotechnology?

Sunprinting and Photolithography

Step 1: Choose a mask.



Step 2: Using UV light, transfer the pattern to the paper.



Step 3: Develop the pattern using H₂O.

