Mask (1B)

Please send corrections (or suggestions) to youngwlim@hotmail.com.

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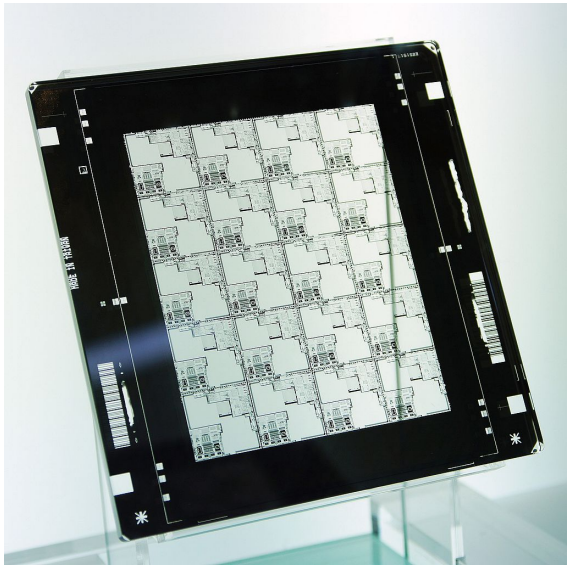
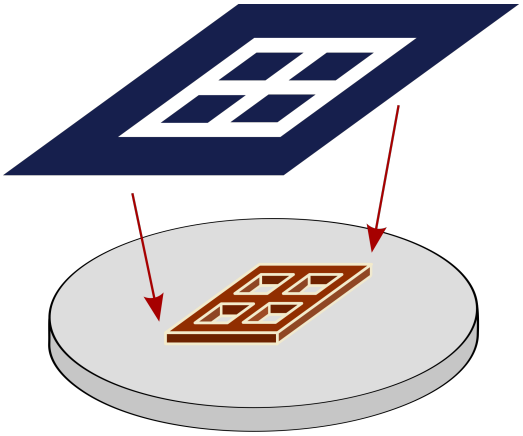
Photomask





A schematic illustration of a photomask (top) and an integrated circuit created using that mask (bottom).

A photomask is an opaque plate with holes or transparencies that allow light to shine through in a defined pattern.

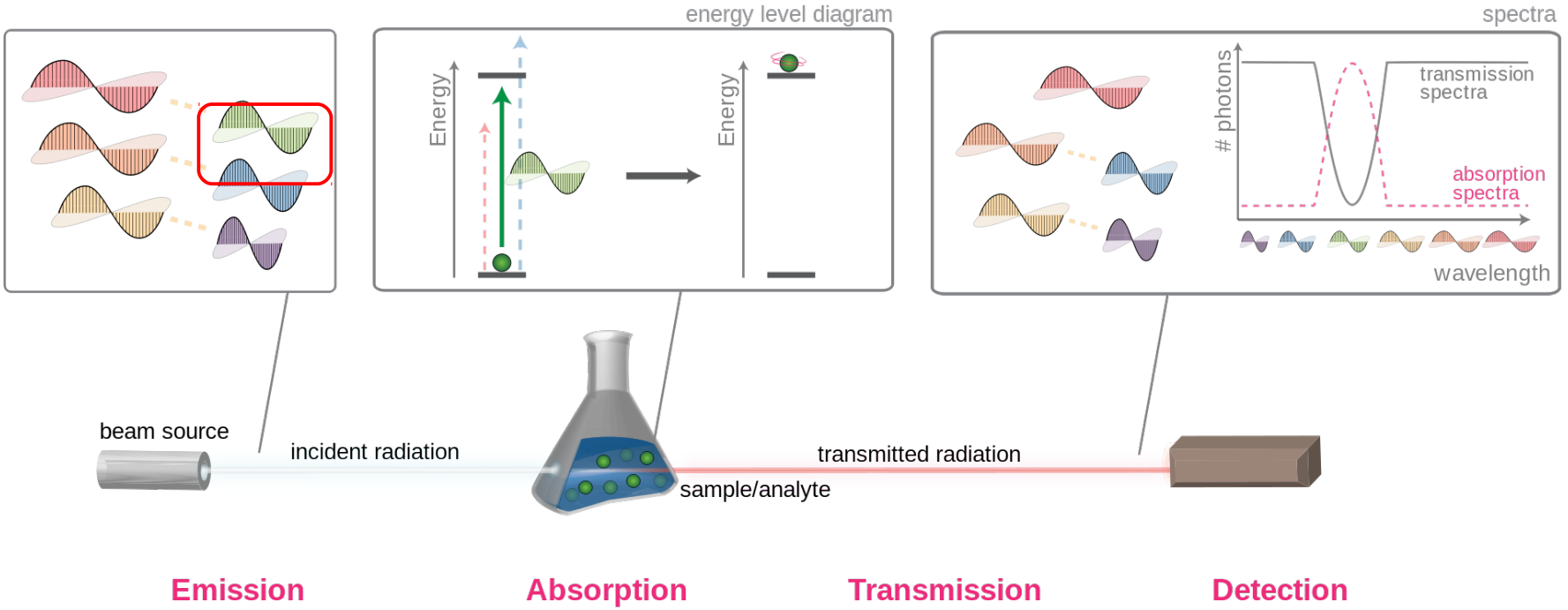
The thicker lines are the integrated circuit that is desired to be printed on the wafer. The thinner lines are assists that do not print themselves, but help the integrated circuit print better out-of-focus. The zig-zag appearance of the photomask is because optical proximity correction was applied to it to create a better print.

Fused Silica & Chrome

Lithographic photomasks are typically transparent fused silica blanks covered with a pattern defined with a chrome metal-absorbing film.

Fused quartz or fused silica is glass consisting of high-purity silica in amorphous (non-crystalline) form. It is different from traditional glasses in that no other ingredients are added to lower the melt temperature. Fused silica, therefore, has much higher working and melting temperatures than soda-lime or borosilicate glasses.

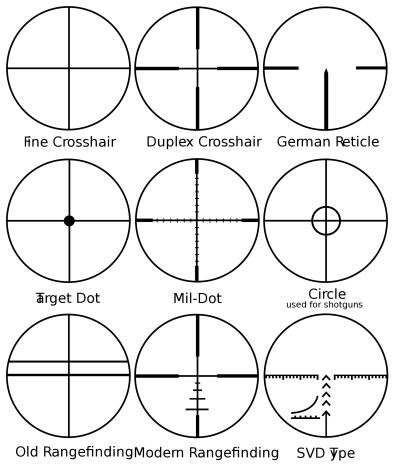
Absorption



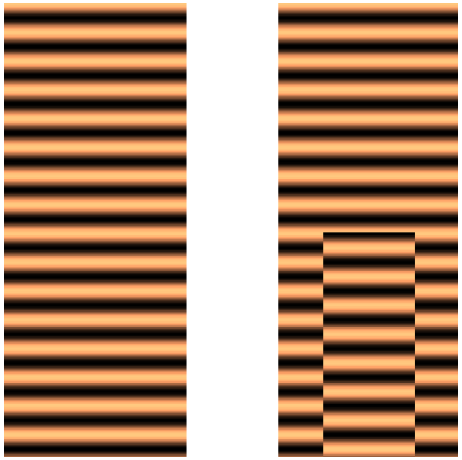
An overview of electromagnetic radiation absorption. This example discusses the general principle using visible light as a specific example. A white beam source – emitting light of multiple wavelengths – is focused on a sample (the complementary color pairs are indicated by the yellow dotted lines). Upon striking the sample, photons that match the energy gap of the molecules present (green light in this example) are absorbed in order to excite the molecule. Other photons transmit unaffected and, if the radiation is in the visible region (400-700nm), the sample color is the complementary color of the absorbed light. By comparing the attenuation of the transmitted light with the incident, an absorption spectrum can be obtained.

Reticle

A reticle (or reticule) is a net of fine lines or fibers in the eyepiece of a sighting device, such as a telescope, a telescopic sight, a microscope, or the screen of an oscilloscope. The word reticle comes from the Latin "reticulum," meaning "net." Today, engraved lines or embedded fibers may be replaced by a computer-generated image superimposed on a screen or eyepiece. The term graticule is the synonymous term from French, coming from the Latin craticula for gridiron. Both may be used to describe any set of lines used for optical measurement, but in modern use the term reticle is most commonly used for gunsights and such, while graticule is more widely used for the covers of oscilloscopes and similar roles.

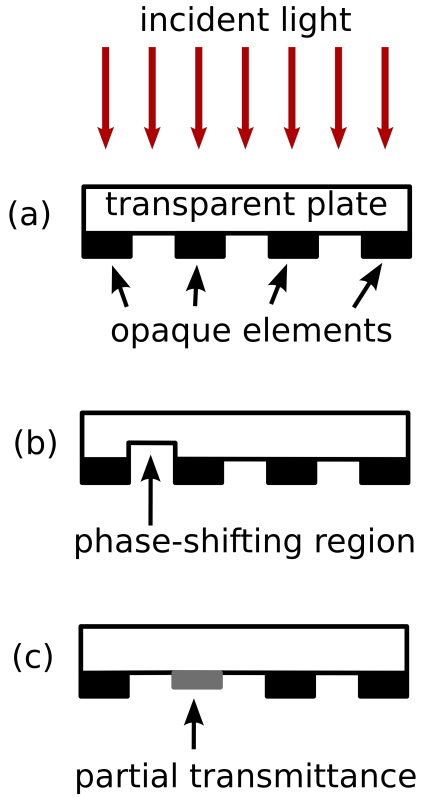


Phase Shift Mask



Phase-shift masks are photomasks that take advantage of the interference generated by phase differences to improve image resolution in photolithography. There exist alternating and attenuated phase shift masks.

Left: the real part of a plane wave traveling to down.
Right: the effect of introducing in the path of the wave a transparent mask with a 180° phase-shifting region. (The illustration on the right ignores the effect of diffraction which increases in significance as the wave propagates.)



Mask

1. Layout
2. Digitizing
3. Pattern Generation
4. Step & Repeat
5. Plate Processing
6. Master Mask

1. CAD design on a computer design
2. Patterns printed on paper
3. Patterns photographically reduced on 35-mm film or microfiche
4. Photoresist (PR) + UV light
5. Photoresist Master

The reduced photographic image serves as the photomask in 1:1 contact photolithography using positive photoresist (PR); (e) the exposed PR is developed;

Photolithography

E-beam Lithography

Electron Beam, Maskless lithography

E-Beam Lithography

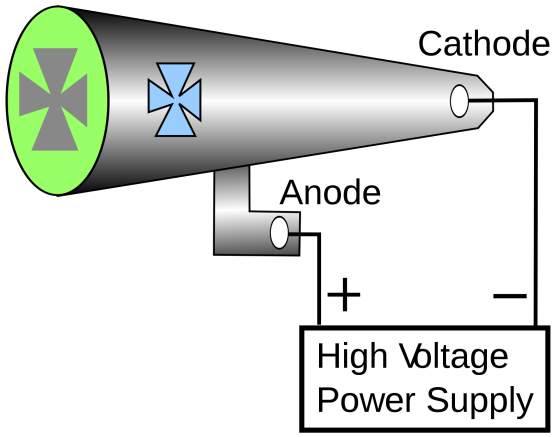
the practice

of emitting a beam of electrons in a patterned fashion across a surface covered with a film (called the resist), ("exposing" the resist) and

of selectively removing either exposed or non-exposed regions of the resist ("developing").

The purpose, as with photolithography, is to create very small structures in the resist that can subsequently be transferred to the substrate material, often by etching.

to beat the diffraction limit of light
low-volume production of semiconductor components, and research & development.



Dielectric

References

[1] http://en.wikipedia.org/