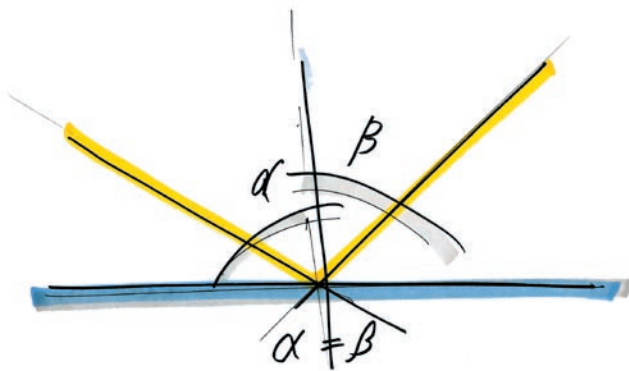


GEOMETRICAL OPTICS

Geometrical optics studies the physical laws giving an explanation for the path of a light beam in materials. Basic concepts in geometrical optics are, e.g., reflection, refraction, transmission, absorption and diffusion.



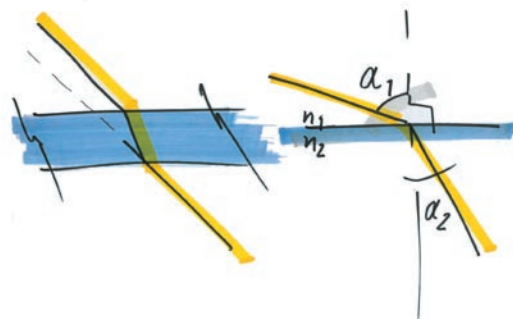
Reflection

Reflection occurs when a beam of light meets a surface. Light is reflected from the surface following the law of reflection: the angle between an incoming ray and a line normal to the surface is equal to the angle of the reflected ray and the normal one. Depending on the quality of the surface, reflection can be specular (polished surface), spread (rough surface) or diffuse (matte surface).

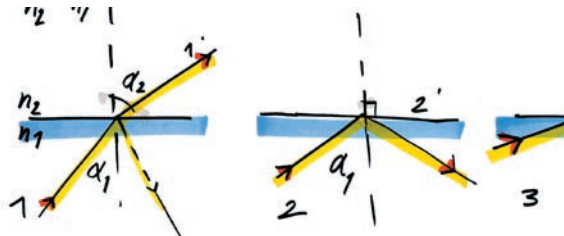
Refraction

When a beam of light coming from one material enters another material, it refracts, i.e., changes angle and velocity. Refraction depends on two factors: incoming angle of the light beam and refractive index of material. Refractive index is the ratio of the speed of light in a vacuum to the speed of the light in that material.

E.g., the magnificent glittering of a diamond is caused by the high refractive index of diamond. Diamond is the most refractive optical material of all.



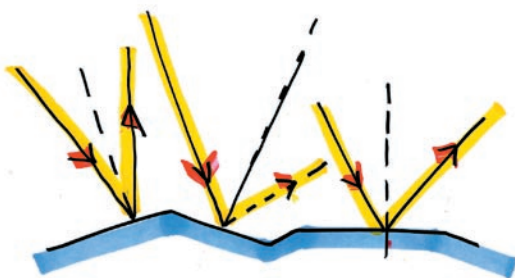
Total Internal Reflection



When a beam of light comes from a material having a greater index of refraction to one with a lower index of refraction, it bends away from normal. When this angle increases, it reaches finally a point, from which forward all light is not anymore refracted but reflected. This phenomenon is used, e.g., in fiber optics and light guides where light has to be transported long ways.

Transmission

When a beam of light goes through an object, it is called transmission. The phenomena that affect light transmission are reflection, refraction, absorption and diffusion. How much they affect is depending on the object's material properties and surface quality.



Absorption and Diffusion

Many materials selectively absorb more of certain areas of radiation. Normally absorbed radiation is converted into heat. Degree of absorption is defined by material thickness and concentration of the absorbing component.

When a beam of light hits a rough surface, it is reflected or transmitted in many directions. This is called diffusion or scattering. The amount of diffusion depends on the difference in refractive index between the materials and the size and the geometry of the diffusing particles compared to the wavelength of the light.

