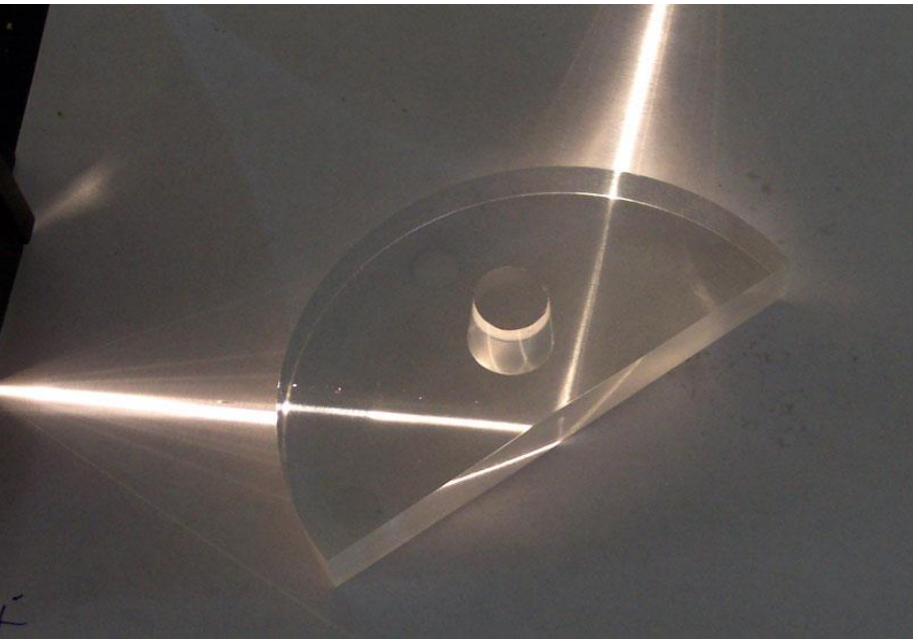
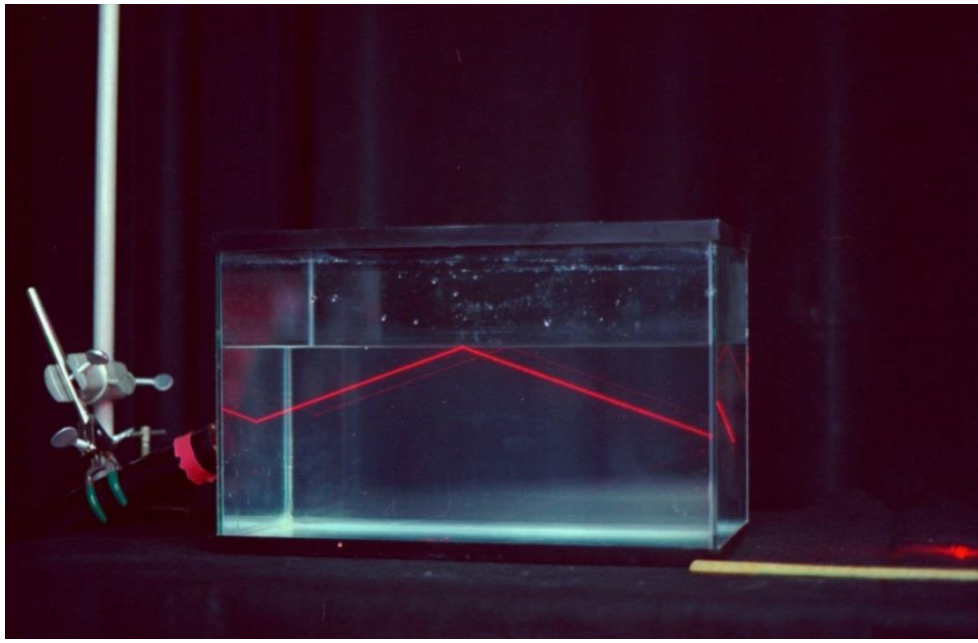
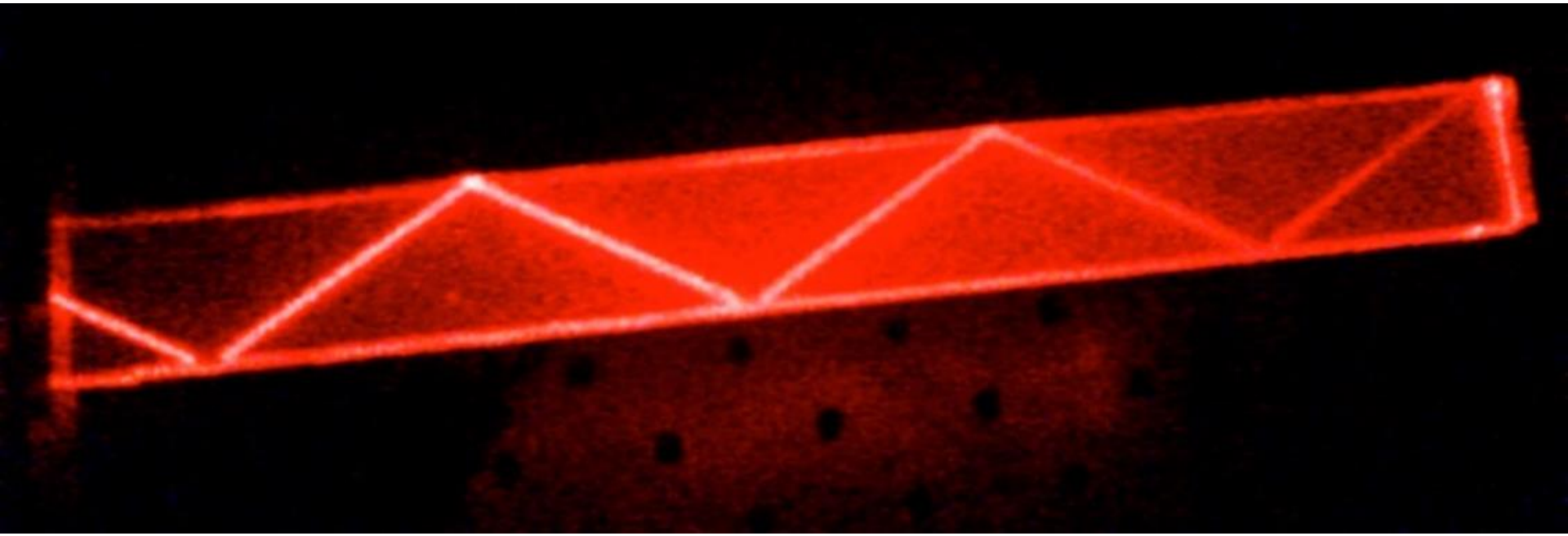
§3.2　全反射和棱镜折射（121～126页）

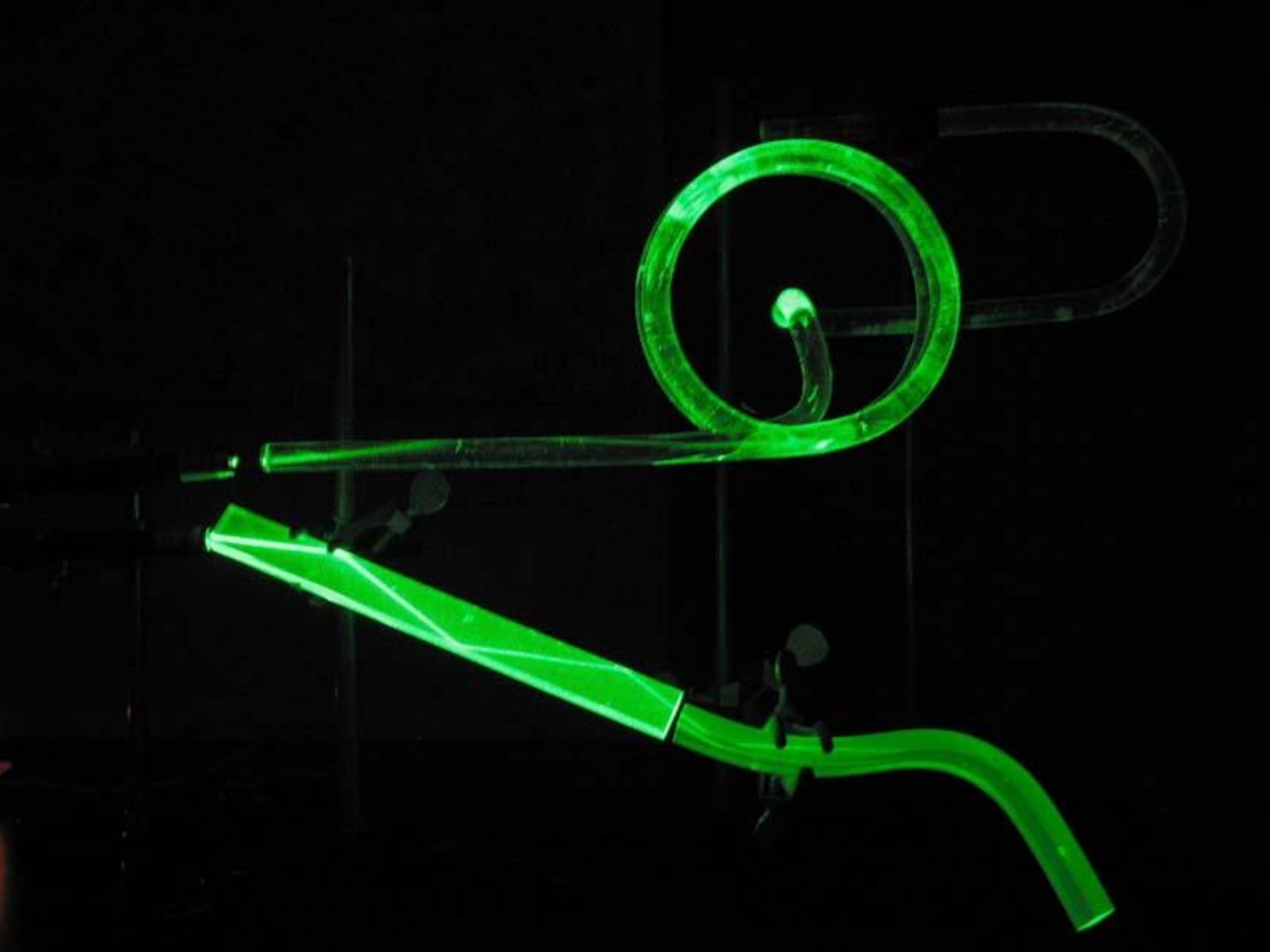
一、 全反射







PMMA（聚甲基丙烯酸甲酯）中的全反射



- 全反射：当光从光密介质（n_1）入射向光疏介（n_2）时,存在一个特殊的角度i_c，如果入射角 $i_1 \geq i_c$ ，则光全部被反射,称 i_c为全反射临界角.

- 全反射产生条件：光密介质（n_1）→光疏介质（n_2）

$$n_1 > n_2$$

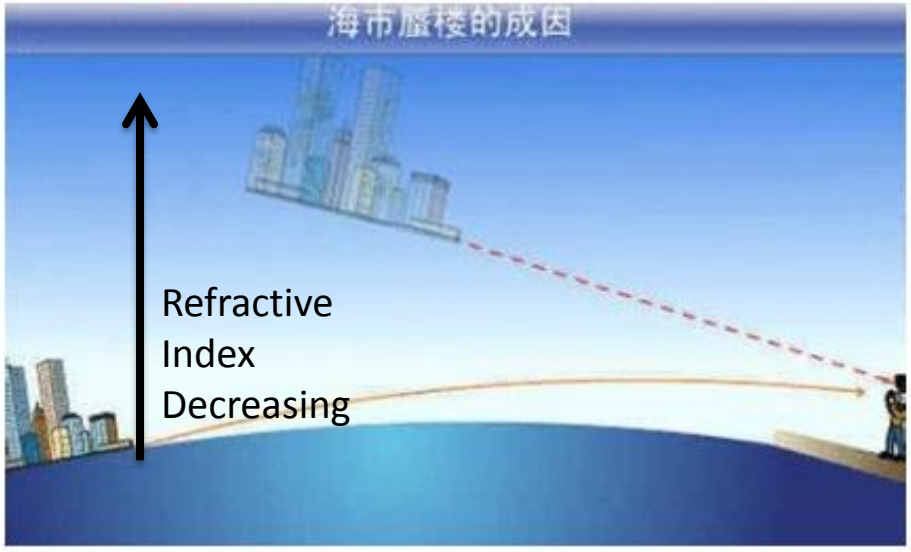
- 现象：折射光线消失，光全部被反射.

$$i_c = \sin^{-1}\frac{n_2}{n_1}$$

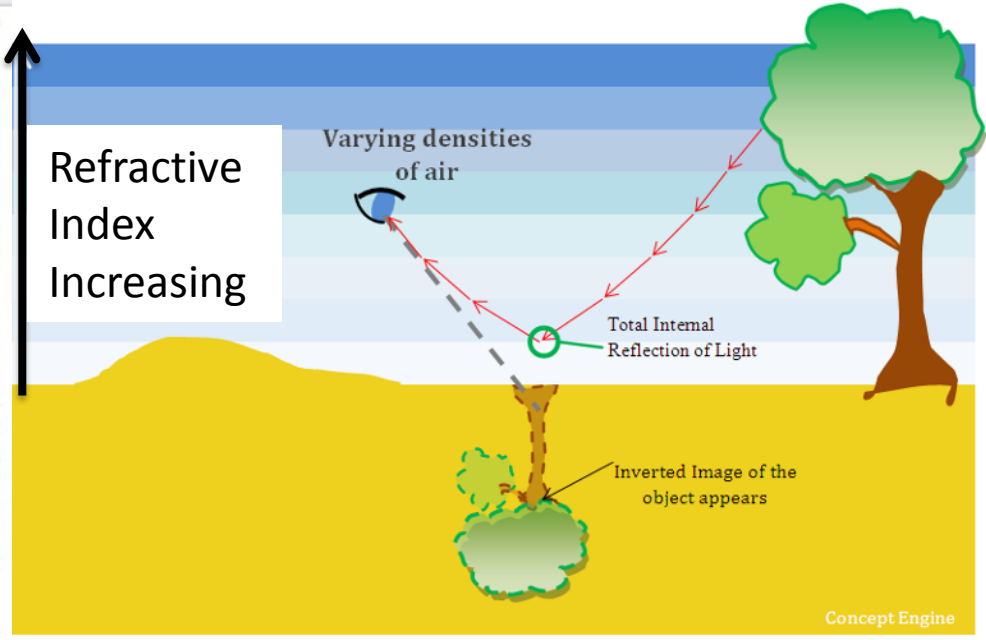
海市蜃楼

前两天拍到青岛海市蜃楼
www.kpkpw.com 870x669

海市蜃楼是一种光学幻景
baike.soso.com 300x221



海市蜃楼 - 团队专题
wenwen.soso.com 485x293



Swimming pool experience:

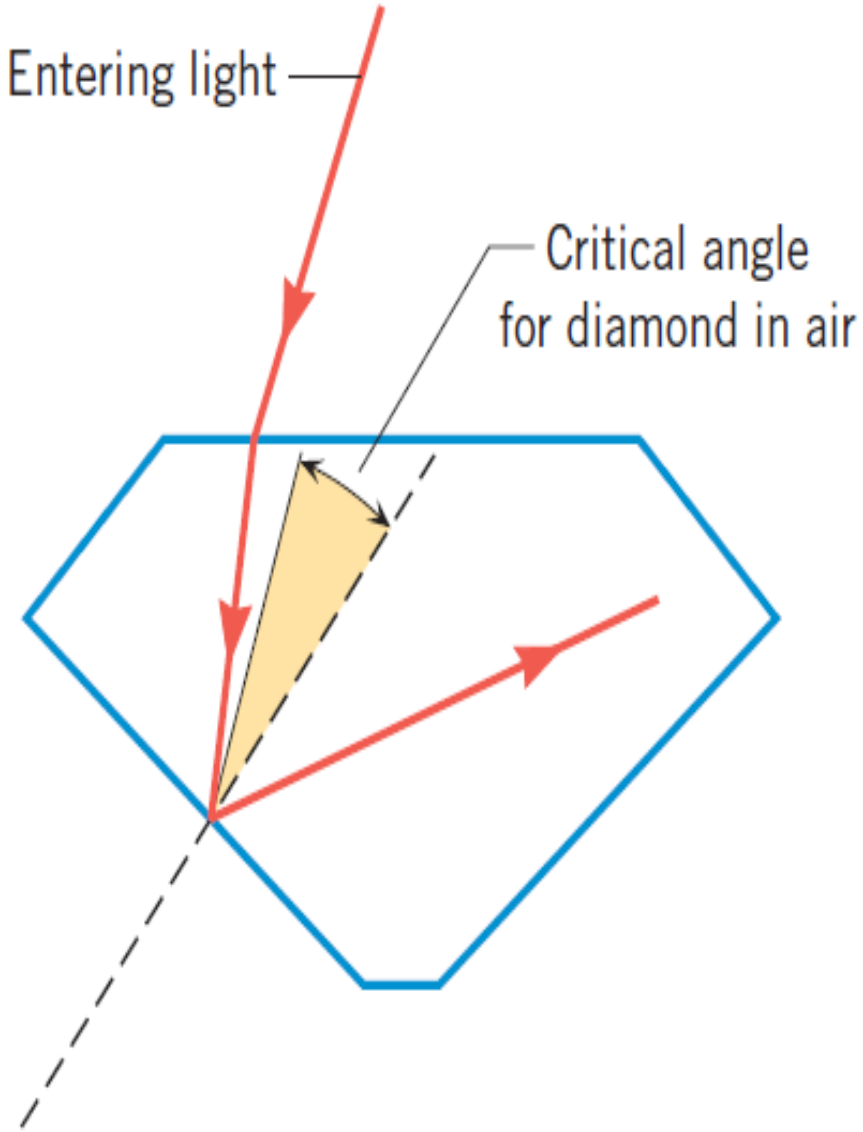
The next time you go swimming, do the following experiment (safely!):

From underwater, look at people or trees outside the water. You will see that you can see them when you view with your eyes at small angles relative to the normal to the water surface. But as you look at larger angles, you find that the water surface suddenly appears weird, somewhat like liquid mercury. This occurs because the water surface reflects like a mirror so that you are not able to observe anything outside the pool. This is a consequence of total internal reflection. (If you will not be swimming for a while, you can also check this by looking at the water-air surface of a fish tank from below.)

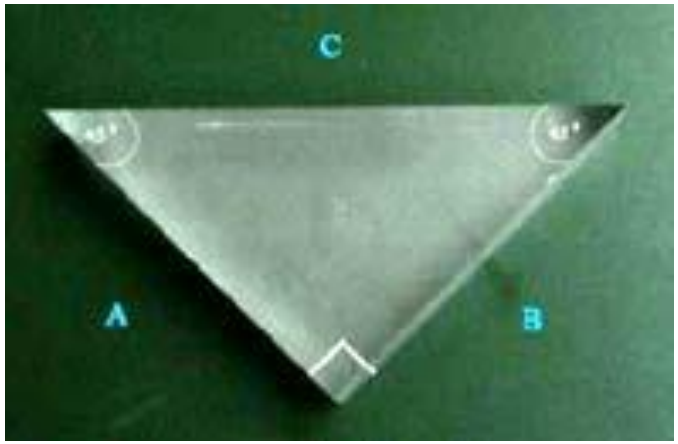
- 全反射的应用

The Physics of **Why a Diamond(n=2.42) Sparkles**

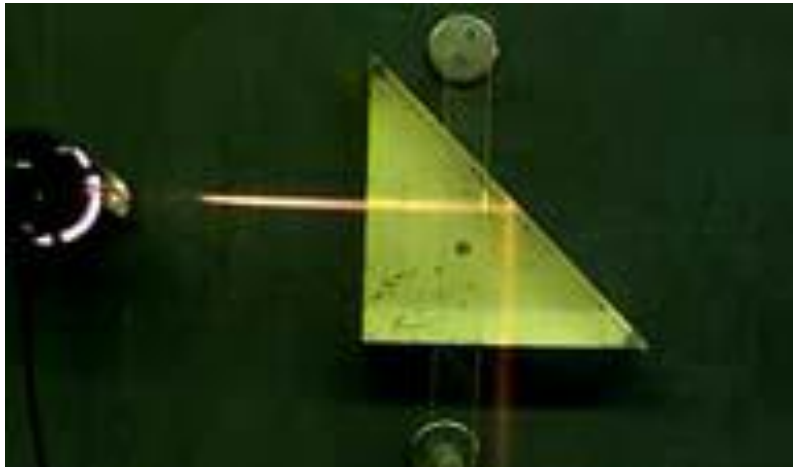
（1）切割钻石

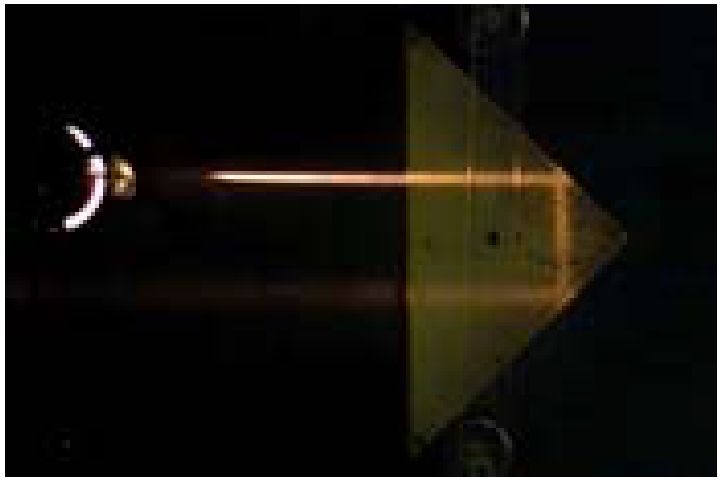


（2）全反射棱镜——主横截面是等腰直角三角形的棱镜.



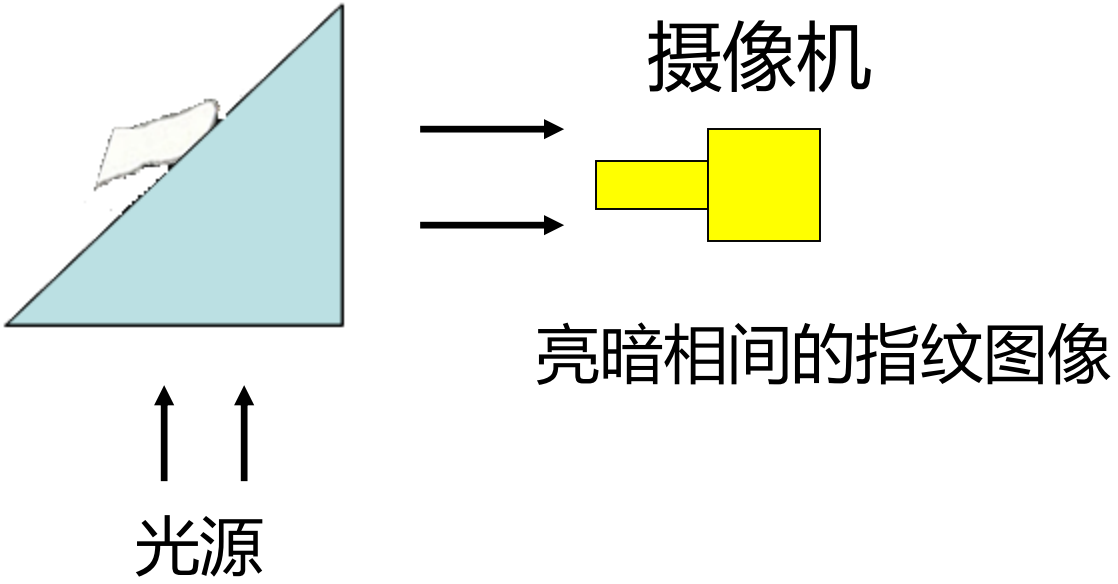
- 全反射棱镜利用全反射来改变光路的行进方向.



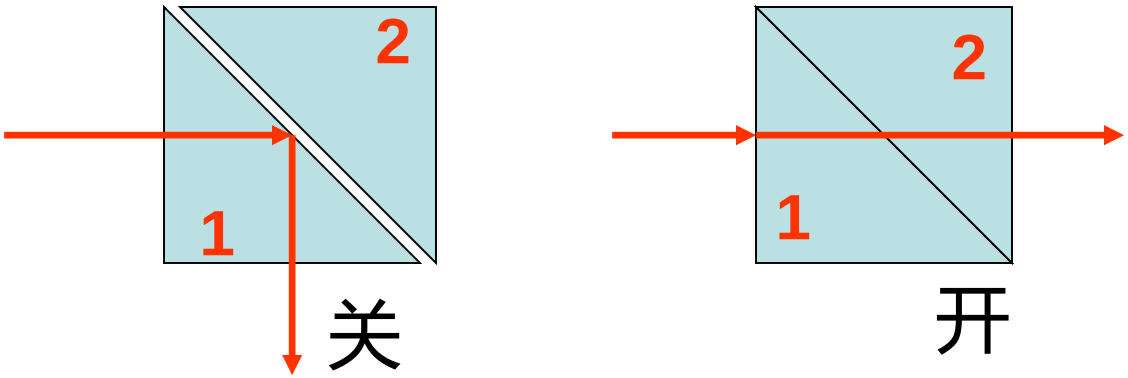


125－126页

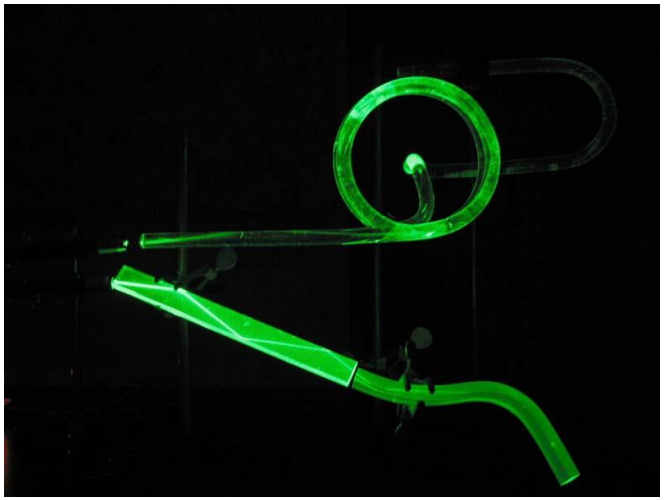
- 指纹锁：

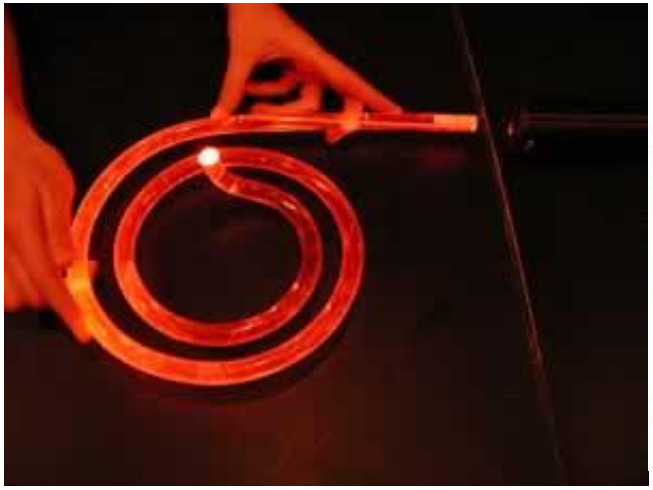


- 光开关



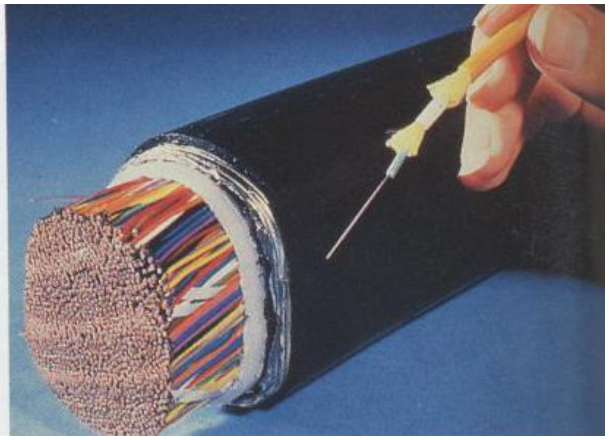
（3）光学纤维（122-123页）



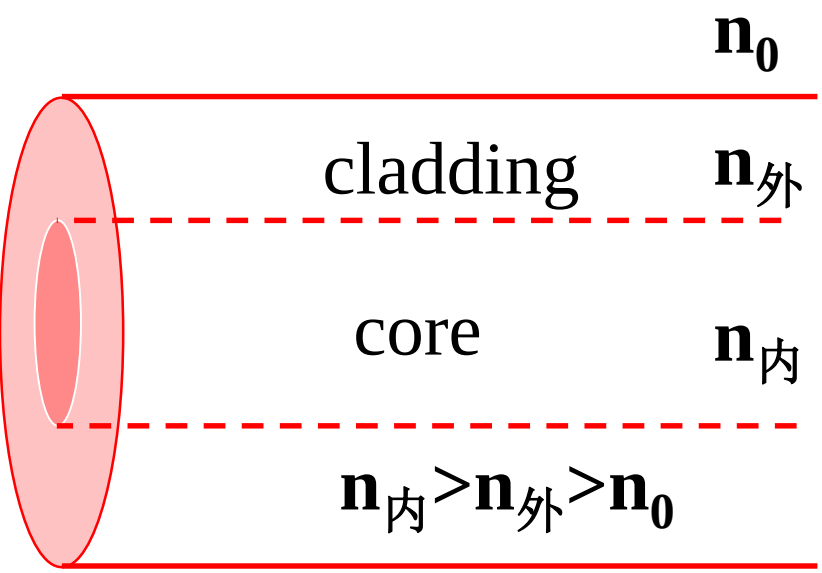


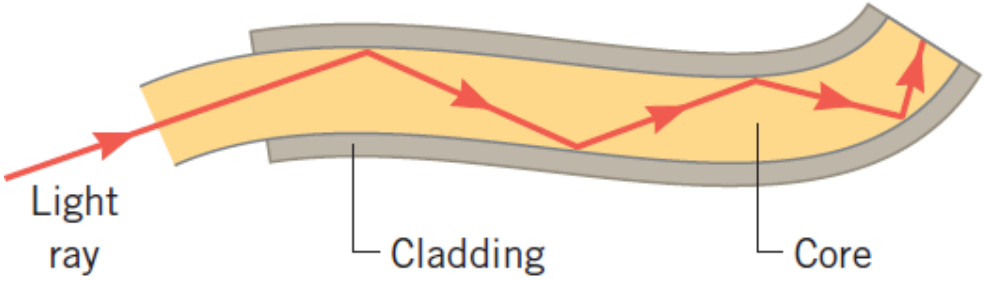
七彩光纤照明产品 市场前景好[组图]

info.lamp.hc360.com 380x261



◆ 光纤：直径为几微米~几十微米的芯线，外包透明介质（包层）.

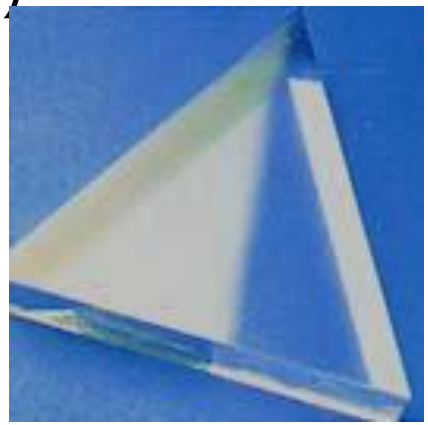




◆只有在顶角为 2 i 范围的光才能在光纤中传播.

$$i = \arcsin\sqrt{\frac{n_{内}^2 - n_{外}^2}{n_0^2}}$$

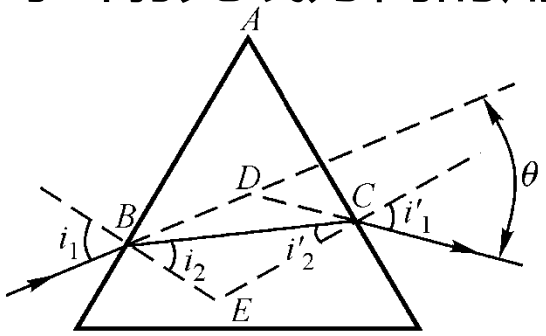
二、等腰三棱镜的最小偏向角（124 - 125页）



- 等腰三棱镜的横截面为等腰三角形 .
- 等腰三棱镜的第一个作用是使光线偏折.

1.偏向角（空气中的棱镜）

偏向角：由入射光线方向转向出射光线方向的角度，用θ表示.



2.最小偏向角（ ）

进一步可解出：$i_1 = i_1'$ 入射光线和出射光线对称.

$$\sin\frac{\theta_0 + A}{2} = n\sin\frac{A}{2}$$

例：P160 3.4

三、 棱镜的色散（分光）

棱镜的第二个作用是使入射白光的各色光散开，沿不同方向出射，这种性质称为棱镜的色散.（详见6.4节）