

双语阅读

Bilingual Reading

小现象大科学

主 编 刘世一 吴志强 副主编 陈永涛

文心出版社
WENXIN PUBLISHING HOUSE



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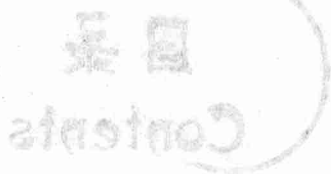
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物理篇



卷之五





Static Electricity

When a plastic ruler has been rubbed against wool, it will attract small pieces of paper. To explain why this takes place, we must refer to our knowledge of the electrical balance of the atom.

As explained previously, electrons orbit the nucleus, just as planets orbit the sun. But there is a difference: the latter maintain their orbits by gravitational attraction, whereas the former maintain their orbits by electrical attraction, since unlike charges attract each other (i.e. the negative charge of the electron is attracted by the positive charge of the proton), thus making the whole atom electrically neutral.

But if electrons are removed from, or added to, an atom, they will then carry an electric charge, and such charged atoms are known as ions.

The simplest method of achieving this is by friction. Electrons are dislodged from the atoms of the plastic ruler, leaving them with too few, and thus carrying a positive charge. Electrons are added to the atoms of the wool, thus giving them a negative charge.

In this way we have got an electric charge. An electric charge made in this way is known as static electricity.

静电

当我们用呢绒摩擦一把塑料尺时,这把塑料尺可以吸住一些小纸屑。要解释为什么会产生这种现象,我们需要参考有关原子电平衡的知识。

正如以前解释过的,电子围绕原子核运行,就像行星围绕太阳运行一般。然而不同的是:后者由于万有引力而保持其运行,前者则由于静电引力而保持其运行。由于异电相吸(即电子的负电荷被质子的正电荷吸引),使得一个完整的原子是中性的。

如果电子从一个原子中排离出来,或者增加进去,那么,这个原子就带电荷,





这种带电荷的原子叫做离子。

要做到这一点,最简便的方法就是摩擦。电子从塑料尺内的原子中逸出,所剩无几,因而塑料尺带有正电荷,加入呢绒中原子的电子则使呢绒带了负电荷。

这样我们就可获得电荷。通过这种方式产生的电荷叫做静电。



大科学

静电就是物体表面过剩或不足的静止电荷,它可以通过物体摩擦(电子的转移)而形成。

Microwaves

Microwaves are a kind of radio frequency energy (electromagnetic waves). Their frequency (the number of times the wave vibrates each second) is much higher than most other types of radio and TV waves.

Microwaves are used for telephone and satellite communications, and for fast cooking. When microwaves pass through food, they cause the molecules in the food to move back and forth very rapidly. This generates heat. Have you ever rubbed your hands together rapidly to warm them? A microwave oven works in a similar way. Microwaves vibrate the molecules of water, sugar and fat in food, but pass right through glass, pottery, paper, wood and plastic. That is why, although food cooks in a microwave oven, the dish doesn't get hot—except for some heat transferred from the food. Metal blocks microwaves, so should never be used in a microwave oven.

微波

微波是一种射频能量(电磁波)。它们的频率(波每秒振动的次数)远远高于大多数其他类型的无线电波和电视波。

微波用于电话通信和卫星通信,并用于快速烹调食物。当微波穿过食品时,它们会使食品中的分子发生非常快的前后运动。这种运动就会产生热。你是否



曾经通过快速搓手来取过暖？微波炉就是以类似的原理工作的。微波使食品中水、糖和脂肪的分子发生振动，但对玻璃、陶瓷、纸、木料和塑料却仅仅直接穿过而已。尽管把微波炉里的食品加热了，但盛放食品的盘子却不热（不过有些热量会从食品传递给盘子），原因就在这里。金属会阻断微波通过，所以在微波炉里绝对不能用金属器皿。



大科学

微波是一种射频能量，用于电话通信和卫星通信，并用于快速加热食物。当微波加热食物时，是通过使食品中的分子发生非常快的前后运动而产生热的。

Heat Transfer

A thermos flask used in our daily life is a typical example of slowing down the transference of heat. It is a container made of two glass walls with inner surfaces silver-coated and with a vacuum space in between. The bottle is plugged by a cork. The hot water filled in the bottle can be kept warm for a long time because the glass walls and the cork stopper conduct very little heat. The vacuum space in between the glass walls prevents the heat circulation. In addition, the silver-coated inner surfaces of the glass walls reflect back the heat radiated from inside or from outside so that the loss of radiating heat is minimized. In this way, the heat preservation is achieved by means of full avoidance of all the three forms of heat transfer. In industry, people often use thermos flasks to preserve liquid nitrogen, dry ice (solid carbon dioxide) and other cooling agents.

The snow covers the wheat fields like a cotton quilt protects the wheat seedlings from being injured by frost. It is because the snow has little ability either to conduct or to radiate heat and the air is also a poor heat conductor. Therefore, the heat in the soil cannot be dissipated easily, keeping the wheat seedlings warm and growing well.

In winter, people are fond of wearing a down-padded coat. It is quite soft and





warm. Fine down and the air in the porous space are poor heat conductors. Down itself cannot provide the body with any heat, but it prevents the body heat from escaping through the coat. In our daily life we can see many effective ways used to slow down and limit the heat transfer everywhere.

热量传递

我们日常生活中使用的保温瓶是减慢热量传递的一个典型例子。它是由两层内表面覆盖银镀层的玻璃墙组成的容器,两层玻璃墙之间被抽成真空,瓶口塞上软木塞。由于玻璃墙和软木塞的热量传递非常少,因此注入瓶中的热水可以保温很长时间。在玻璃墙之间的真空可以防止热量的对流。另外,在玻璃墙上的银镀层可以反射来自里面或外面的热量辐射,从而将热辐射的损失降到最低。通过采用避免热量传递的三种途径保存了热量。在工业中,人们通常采用保温瓶来存液态氮、干冰(固态二氧化碳)和其他制冷剂。

覆盖在麦田上的雪像棉被一样保护麦苗免受霜冻的损害,因为雪传导和辐射热量的能力很差,加上空气是热的不良导体,因此在土壤中的热量不容易散发,从而保持麦苗的温度和正常生长。

在冬天,人们爱穿羽绒服,它柔软暖和。良好的羽绒和其中的空气都是热的不良导体。羽绒本身不能给身体提供热量,但它可以防止身体的热量通过衣服而散发。在我们的日常生活中,有效减慢和限制热量传递的方法随处可见。



大科学

保温瓶中的玻璃墙和软木塞的热量传递非常少,因此注入瓶中的热水可以保温很长时间。另外,在玻璃墙之间的真空可以防止热量的对流,在玻璃墙上的银镀层可以反射来自里面或外面的热量辐射,从而将热辐射的损失降到最低。

to radiate heat and the air is also a poor heat conductor. The heat in the soil cannot be dissipated easily, keeping the wheat warm and growing well. In winter, people are fond of wearing a downy-padded coat. It is quite soft and



Sublimation

In winter, people usually hang their washings in the open air and the wet clothes will be frozen. The stiffened clothes will become dry gradually because the ice turns into vapor directly without melting. The white camphor balls are quite big before we put them in the trunk. But several months later, the camphor balls in the trunk will become smaller and smaller and finally they will disappear. But we can sense the smell of camphor from the clothes. Where have these camphor balls gone to? Actually, the naphthalene in the camphor ball has changed directly from its solid state to gaseous state. This phenomenon of changing from the solid phase directly to the gaseous phase without melting is called sublimation.

On the contrary, it is not unusual to discover a change from the gaseous phase directly to the solid phase. For example, frost is rather commonly seen in winter. There are actually fine crystalline ice deposited directly from the vapor in the air. A change from the gaseous phase directly back to the solid phase is called desublimation.

The typical experiment to observe the phenomenon of sublimation and desublimation is to heat solid iodine in a flask. By giving a little heat to the flask, we can see some violet gas produced from the solid iodine, and when we stop heating, we can see some iodine crystals condensed on the wall of the flask.

Experiments show that a certain amount of heat will be absorbed during the process of sublimation of a substance. Therefore, in the process of production, we often utilize the characteristic of sublimation to absorb heat to get a low temperature. For example, in the food industry, we often make use of the sublimation process of the solid carbon dioxide to absorb heat so as to freeze food in the storage.

升 华

在冬天,人们经常把洗了的衣服挂在屋外,而湿的衣服会结冰。僵硬的衣服





则会逐渐地变干,因为冰会变成气体直接蒸发掉。白色的樟脑球在我们放到箱子里之前很大。几个月以后,箱子里的樟脑球会变得越来越小,直至最后消失。但是我们可以闻到衣服上樟脑的气味。这些樟脑球去哪里了呢?事实上,樟脑球中的萘已经直接从固体状态变成了气态。这种由固态直接变成气态而没有融化的过程叫做升华。

相反,由气态直接变成固态的转变是常见的。例如,霜在冬天是常见的。这些冰晶是空气中的水汽直接沉积而成的。从气态直接变成固态的变化过程叫做凝华。

典型的观察升华和凝华现象的实验就是给在烧瓶里的固体碘加热。给烧瓶加一点热,我们会看见紫色的气体从固体碘上升起。当我们停止加热会发现,碘的结晶附着到烧瓶壁上。

实验表明,在物质升华的过程中会吸收一定的热量。因此,在生产过程中,我们经常利用升华的特性——吸收热量来降温。例如,在食品工业中,我们经常利用固体二氧化碳的升华过程吸收热量,来使贮存库中的食物冻结。



大科学

物质由一种形态变成另一种形态时,通常是一种物理变化,如固体碘遇热变成气体,樟脑球变得越来越小,直至最后消失,等等。这种由固态直接变成气态而不经融化的过程叫做升华。

Why Is Gravity in Space Not the Same as Earth?

Every object in the universe pulls on every other object. This is called gravitation, or gravity. But the strength of that pull—of gravity—depends on two things.

Firstly, it depends on how much matter a body contains. A body (object) that has a lot of matter has a lot of gravitation. A body that has very little matter has very little gravitation. For example, the earth has more matter than the moon, so the earth's pull or gravitation is stronger than the moon's.

Secondly, the strength of gravitation depends on the distance between the bodies.





It is strong between bodies close together. It is weak between bodies far apart.

Now let's take a human being on the earth. The earth has more matter than the human being, so its gravitation pulls him to the earth. But the earth behaves as if all its matter were at its center. The strength of gravity at any place, therefore, depends on the distance from the earth's center.

The strength of gravity at the seashore is greater than at the top of a mountain. Now, suppose a human being goes some distance up into the air, away from the earth, the pull of the earth's gravity will be even weaker.

When people go out into space, they are away from the earth's gravitational field. There is no pull. They are in a condition of weightlessness. And this is why, in rockets and space capsules, weightless astronauts and objects float about in the air.

为什么引力在太空和在地球上不一样?

宇宙中的每一个物体都将另一物体拽向自身,这叫引力,但那个拉力(引力)的强度取决于两个因素。

首先,它取决于一个物体所含物质的多少。一个物体所含的物质多,它的引力就大。一个物体所含的物质很少,它的引力也很小。比如,地球比月球含的物质多,所以地球的拉力或引力就比月球的大。

其次,引力的强度还取决于物体之间的距离。物体之间靠得越近引力就越强,隔得越远引力就越弱。

现在以地球上的一个人为例。地球比此人所含的物质多,所以它的引力把他牢牢地吸住。但地球的行为方式好像是,它所有的物质都集中在它的中心。因此,任何方位引力的强弱都取决于它同地心之间的距离。

在海边的引力就比在山顶的引力要大。现在,假设一个人离开地球,升到空中一段距离,地球对这个人的引力就会更弱些。

当人们进入太空,他们就离开了地球的引力场,那就没有引力了,他们就处于失重状态。这就是为什么在火箭和宇宙飞船里,失重的宇航员和物体会在空中飘浮。





大科学

地球的行为方式好像是，它所有的物质都集中在它的中心，因此，任何方位引力的强弱都取决于它同地心之间的距离。当人们进入太空，他们就离开了地球的引力场，那就没有引力了，他们就处于失重状态。

Gravity and Space Flight

When you look up into the sky on a clear night, you will see the moon and the stars. Since ancient times men have been curious to know more about the moon, the stars and other bodies in the sky.

Today, scientists are able to land men on the moon. To get out into space and travel to the moon or other planets we have to build space rockets. Scientists have been working on this for a long time. It is only recently that they have been able to build rockets powerful enough to get out of earth's gravitational pull.

What is gravitational pull? If you throw a ball up, it will come down again. The ball comes down because it is pulled toward the earth. This pulling force is known as the force of gravity. The great speed and power of a space rocket helps itself to escape from the earth's gravitational pull and go into space.

Now a spaceship can even return to earth. When a spaceship returns to earth it will be traveling at a great speed. Yet to land on earth, the returning spaceship must be slowed down. This is done by firing special rockets. They are called retro-rockets.

地球引力和宇宙飞行

在晴朗的夜晚，当你仰望夜空，你能看见月亮和星星。自古以来，人们就渴望了解月亮、繁星和其他天体。

今天，科学家已经能够使人登上月球。要进入宇宙空间，以及抵达月球或其他行星，我们得制造宇宙火箭。科学家长久以来一直为此而工作。直到最近，他



们才能够制造出足以摆脱地球引力的强大火箭。

什么是地球引力？如果你向上扔一个球，它又会返回地面。球之所以落下，是因为受到地球的吸引。这种吸引力是众所周知的地心引力。火箭的飞快速度和强大力量，有助于它摆脱地心引力而进入太空。

现在，宇宙飞船甚至能返回地面。当宇宙飞船返回时，速度很快。在降落到地球上时，返航的宇宙飞船必须减慢速度。这得靠燃烧一种特别的火箭，称做反推进火箭。



大科学

地球任何方位引力的强弱都取决于它同地心之间的距离。宇宙飞船要进入太空，就必须靠强大的力量和飞快的速度摆脱地心引力。

Mirrors

A mirror has a smooth surface, therefore it reflects things well. Look into the mirror and you can see yourself in it. The reflection is called an image.

Since mirrors can reflect light and images, they are used in many ways. We use mirrors to look at ourselves. We use them to look at things behind us. Mirrors in cars and buses are used in this way.

Mirrors are used to “bend” light, too. We can use two or more mirrors to make a periscope.

You will find that an image can also be formed on a screen. Place a lighted candle on a table, and put a white screen in front of the candle. The screen should be 40cm to 50cm from the candle. Now move a lens slowly toward the candle. Stop moving the lens when a picture or image is seen on the screen. But the image is upside down.





镜 子

镜子有光滑的表面,因此反映物体的能力特别好。朝镜子里瞧瞧,你就能看见自己。这种反射出来的物体称为映像。

既然镜子能反射光和像,因此在许多方面得到利用。我们用镜子照自己。我们也用镜子照我们身后的东西。汽车和公共汽车上的镜子就是利用的这个原理。

镜子也被用来“弯曲”光。我们可用两面或多面镜子制成潜望镜。

你会发现,映像也可以在屏幕上显现。在桌上放上一支点燃的蜡烛,在蜡烛前方放一幅白色的屏幕,要离蜡烛 40 至 50 厘米远。然后用一块凸透镜朝蜡烛移近去,直到图像在屏幕上清晰可见为止。但这一映像是倒立的。

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大科学

镜子可反射物体,如穿衣镜、反光镜等。当物体接近凸透镜到一定的距离时,该物体所成的映像是倒立的。

Pressure

Cornstarch, made from corn and used in cooking as a thickening agent (as in gravy), is what is called a colloidal substance. It is made up of small particles that don't dissolve but stay suspended in a fluid. Mixed with water when cornstarch is at rest, it forms a substance that somewhat resembles a liquid, but the substance change its property to be more like a solid when pressure is applied. Pressure sometimes causes a change in matter. Great underground pressure is what creates diamonds. But even squeezing by hand can cause change in certain substances.

