

Color Changes Caused by Heat or Light

熱や光で色変化

■Purpose of Exhibition

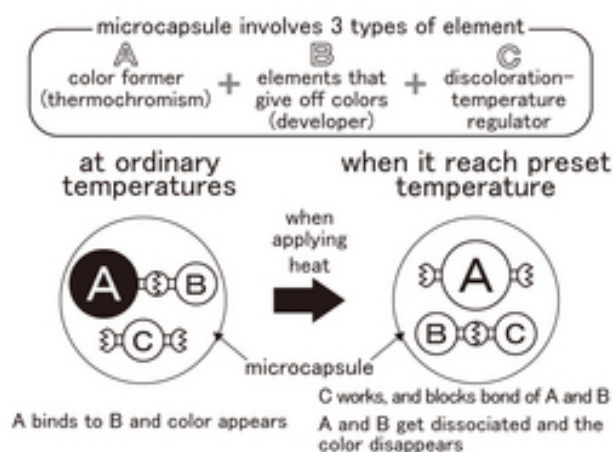
There are two exhibits: One is an exhibit that shows how color change is caused by heat, whereas the other shows how color change is caused by light (UV).

In the first exhibit, when heating colored sheets attached on the wall with the hand (using your body temperature), colors disappear, but when it stops being heated, the colored sheet cools down and colors appear again.

In the second exhibit, the lens color of sunglasses is changed into dark colors by ultraviolet waves from a light pen. When writing your favorite word with the light pen and leaving it for a while, the lens color changes back to the previous one. In this way, reversible color change phenomenon by stimulus from the outside such as heat, light, electricity, some type of solvent, and pressure are called "chromism", depending of the kind of stimulus. We also call the materials containing such functions "chromic pigment" or "chromic particle".



■Additional Knowledge



[Thermochromism]

This is the phenomenon of reversible change of the color caused by a change of temperature.

The color sheets in the exhibit contain very small capsules (microcapsules), which use a special ink. Those microcapsules contain 3 types of ingredients. Depending on heat, changes occur and the capsules become colorless.

When cooling, capsules return to their original state and colors reappear.

(Additional diagram)Extracted from the HP of Pilot Corporation.

The structure of this ink is utilized in erasable ball-point-pens by frictional heat and a color-changing mug when pouring boiling water.

By the way, many of you would have seen point cards for shops and commuter cards which are rewritable; some have a silver surface with white characters, and others have blue or black characters. Those cards are called rewritable. Their structure is a little different, but they also utilize "thermochromism".

For the card with blue or black rewritable characters, 180 degree in Celsius heat is required, followed by a

drastic cooling down period. Characters and colors appear on the heated and cooled down portion, then after that, heated from 120 to 160 degree in Celsius and slowly cooled down, which makes the characters disappear.

This phenomenon can be repeated and the letters can be rewritten again and again.

[Photo-chromism]

The phenomenon of reversible color change by light is called "photo-chromism". Color changes according to certain wavelengths of light.

It returns to its original state by a different wavelength of light or heat.

The lenses on display are variable light sunglasses lenses. Regarding variable light sunglasses, the lenses become darker outside where there is a lot of ultraviolet light. The sunglasses return to their original color indoors. The lens contains colorless halogen silver. However, when UV hit the lens, silver and halogen disassemble (chlorine), silver becomes darker and impervious to visible light. When the UV stops hitting, silver and halogen reassemble, becoming halogen silver again. Then the lens color becomes light. It is not only a discoloration, but there is a vivid photo chromic disassembling that changes the color.

It is also used in painted pictures that change by exposure to light (UV), and ultraviolet check cards. The color change is due to changes in the molecular structure, because the received light wavelength greatly changes.

Using those characteristics, "light recording" and, "light switch" practical uses are learned.

Cooperation: Pilot (THE PILOT INK COMPANY, LIMITED)Article and illustrations by Keiko Ishida, curator