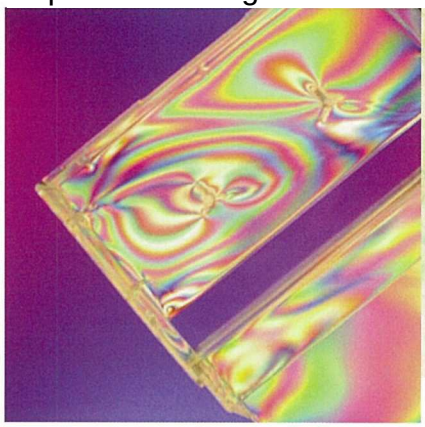
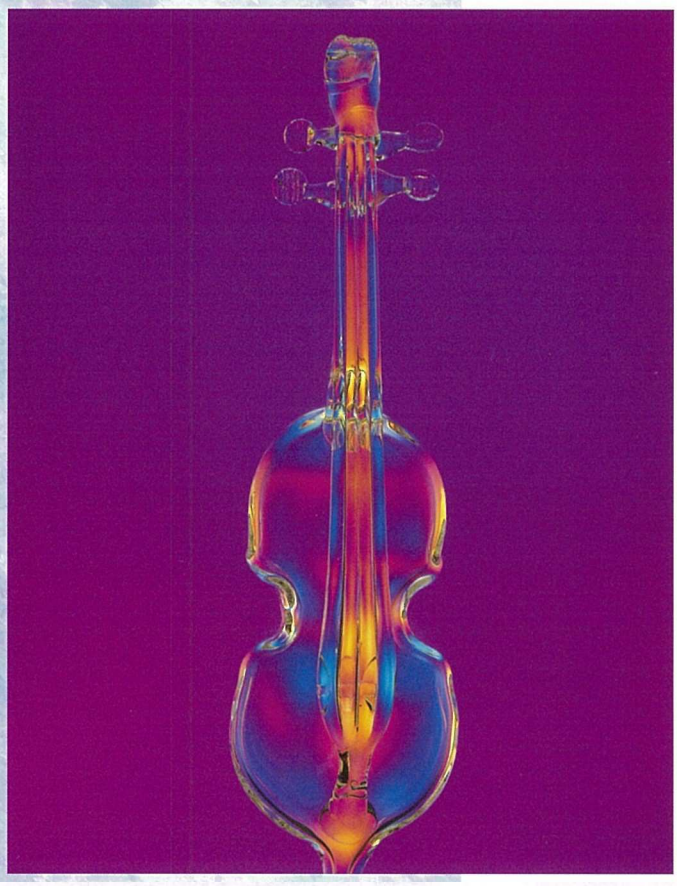
LUCEO Strain meter's Guide

Sensitive color method

An example of appearance under inspection flowing state of resin.





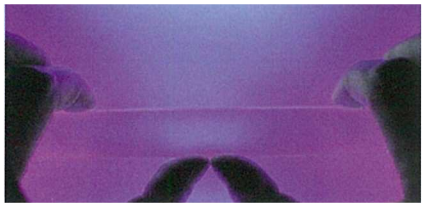
With use of Sensitive Color Method, the entire visual field appears in reddish purple color. When an article to be inspected is placed in a strain meter, a region with strain of the article appears in greenish and bluish color, or orangish and yellowish color, while a region without strain of the article appears in reddish purple color similarly to the appearance of the entire visual field.

Remarks on Determination of Presence of Strain:
In a strain meter, strain is inspected on the basis of color changes in a sample. When a sample to be inspected is inserted within a visual field, the sample gives no change in color and the visual field is maintained in the same appearance if the sample has no strain. However, when Sensitive Color Method is employed, even though the sample contains strain, there is a case where the whole or part of a sample gives no change in color and is kept in the same appearance as that of the visual field. Such a case is resulted from an occasion where the main stress direction of strain in the sample corresponds to the transmission axis of a polarizer or an analyzer. Therefore, when a sample is observed under such a condition, the presence of strain in the sample may not be

As a remedy against this problem, a method to check changes in brightness and color in the whole or part of a sample while rotating the sample can be used. In this method, a sample is rotated by greater than 90° with gazing at the sample, and in case the sample gives no change in the brightness and color at any angles and appears in the same state as the visual field, it is determined that the sample has no strain in the whole or part. In case a change was found during the rotation of a sample, it is determined that the sample has strain in the part causing the change. Then, at the rotation angle at which the change was found, distribution and intensity of strain are to be evaluated.

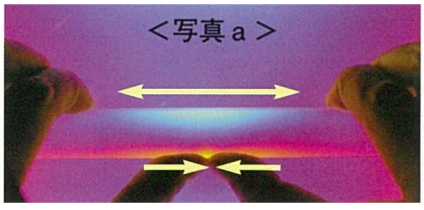
Determination of Nature of Strain (Whether it is stress in compression or stress in tension.):

For the determination if stress is stress in compression or stress in tension, a stress-direction-determining bar is employed. Photo a shows a stress-direction-determining bar made of acryl resin in the state being given with strain by curving the bar with fingers, and photo b shows a stress-direction-determining bar made of glass. Whether stress in a test sample is stress in compression or stress in tension can be determined by comparing the observed color with colors of respective parts of the stress-direction-determining bars indicating stress in compression or stress in tension. Since colors appearing in photos shown below may differ due to degree of curving force of fingers, it is required to determine the color by the operator itself with controlling force to be applied.



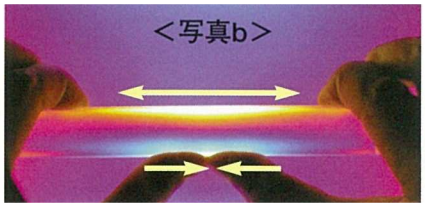
Stress-direction-determining bar with no strain

The whole bar appears in reddish purple (sensible color) similarly to the color of visual field.



Stress-direction-determining bar <Acryl> having strain

When force is applied with fingers to a bar, stress in tension is liberated in the direction indicated by arrows ←→ in the upper region of the bar, while stress in compression is liberated in the direction indicated by arrows →← in the lower region of the bar.



Stress-direction-determining bar <Glass> having strain

When force is applied with fingers to a bar, stress in tension is liberated in the direction indicated by arrows ←→ in the upper region of the bar, while stress in compression is liberated in the direction indicated by arrows →← in the lower region of the bar.

* Due to difference in quality of a material, such as glass and acryl, there may a case that the foresaid relativity between the stress direction and the color change cannot be applied. In order to carry out accurate determination, it is recommended to check color change beforehand with a bar-shaped sample for preliminary purpose, which is made of the same material as that of a

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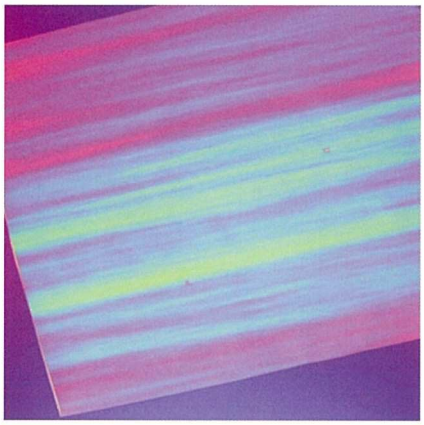
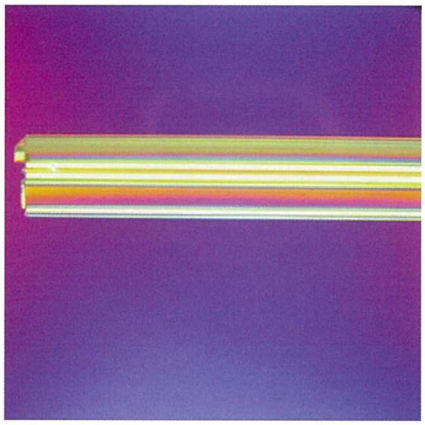
Sensitive color method

Example of Appearance under Inspection
Unevenness of a Film

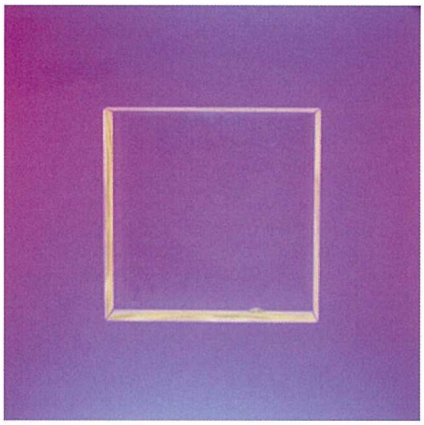


Example of Appearance under Inspection
Strain resulted from Processing

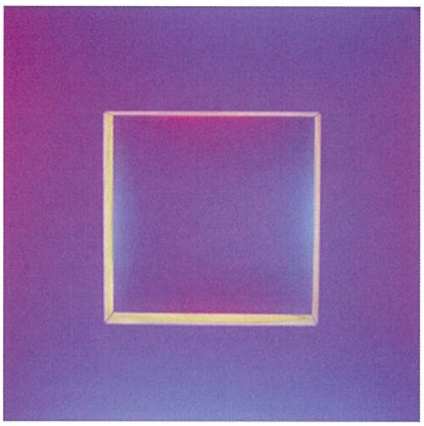


Example of Appearance under Inspection
Strain and cracks in a molded article.

Sample with substantially no strain
Color of region in outer periphery of a sample, where strain exists, changes to greenish and bluish color or orangish and yellowish color.

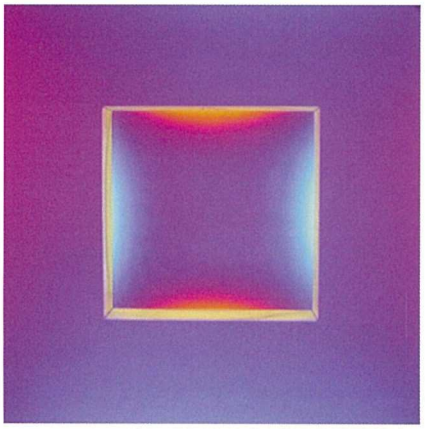


Sample with less degree of strain
A rotating frame of analyzer is rotated so that a region to be assayed (indicated with an arrow) gets darker.



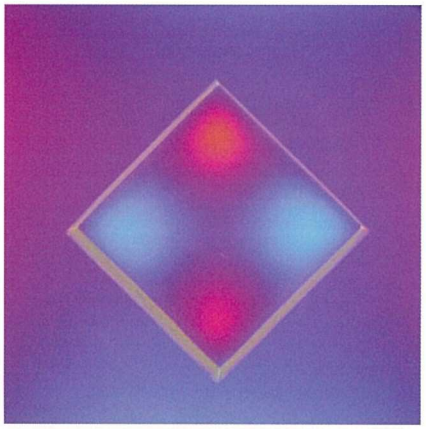
Sample with greater degree of strain
Color change of region in the outer periphery of a sample, where strain exists, extends inwardly. Also, the yellowish or bluish color appears more intensive and brighter than that of a sample with less degree of strain.

Sample at the Reference Position/
Rotated Angle 0°
Only X-shaped region in the transmission axis direction of a polarizer or an analyzer does not cause color change and is kept in reddish purple color (sensible color) similarly to the visual field.



Sample rotated by 45°

X-shaped region appeared in sensitive color remains in the same direction irrespective of the direction change of a sample. Due to this, the pattern of strain varies.



Sample rotated by 90°

Pattern of strain in a sample is same as that of a sample at the reference position.