ed on asymmetric synthesis, (1R : 2R) and (1R : 2S)-configurations were assigned to these isomeric acids and consequently the absolute configuration of (−)-*cis*-umbellularic acid revealed all the configurations of terpenoids of thujane series.

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A Study of the Absorption Spectra of Cerium in Glasses

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Yogyo Kyokaishi (Journal of the Ceramic Association, Japan), **68**, 132 (1960)

The absorption bands of cerium in trivalent and tetravalent states in silicate and phosphate glasses, whose exact positions are still open to discussion, and the effects introduced by the change of composition and of melting condition were investigated.

For the measurement of the absorption spectra of silicate glasses with poor ultraviolet transmission the thickness of the sample plates was reduced to 0.12～0.02mm by polishing.

The results obtained are as follows: (1) In the silicate glass consisting of K_2O, BaO, and SiO_2, Ce^{3+} gives a sharp and weak absorption band at 320 mμ, whereas Ce^{4+} gives a broad and strong absorption band in ultraviolet region below 350 mμ. (2) In the phosphate glass consisting of K_2O, BaO, Al_2O_3 and P_2O_5, Ce^{3+} gives three sharp and weak absorption bands at 294, 245, and 227 mμ, whereas Ce^{4+} gives a broad and strong absorption band in ultraviolet region, as before.

Studies on the Mechanical Strength of the Photosensitive Opal Glass

Megumi TASHIRO and Sumio SAKKA

Yogyo Kyokaishi (Journal of the Ceramic Association, Japan), **68**, 158 (1960)

When a lithium containing photosensitive glass is exposed to ultraviolet light and then subjected to the heat treatment, it changes into a polycrystalline material characterized by its good mechanical properties (S.D. Stookey, *Ind. Eng. Chem.*, **45**, 115 (1953)).

The purpose of this paper is to present the relation between the mechanical strength and the grain size of the constituent crystallites of the resultant material.

Glass specimens (2.5×5×5 0mm) of the oxide composition SiO_2 81, Li_2O 12.5, K_2O 2.5, Al_2O_3 4, CeO_2 0.03, Au 0.027% (wt.) were exposed to ultraviolet light by placing them at a distance of 10 cm from a 500 watt high pressure mercury lamp for 2 to 1000 min. After the exposure they were heated at three steps; first at 510°C for 30 min. to cause formation of gold nuclei, then at 620°C for 60 min. to

cause crystallization of lithium metasilicate partially (40%) from the base glass, and finally at 900°C for 60 min. to convert almost the whole of the base glass to polycrystalline materials consisted of lithium disilicate and β-quartz. The grain size of the constituent crystallites of the resultant material was able to be varied from 0.85 to 2.3μ by changing the U. V. exposure time (Ref. M. Tashiro and S. Sakka, *J. Ceram. Assoc. Japan*, **67**, 263 (1959)).

Tests for bending strength and Vickers hardness were made with two classes of specimens, one which completed a whole course of the abonve heat treatments and the other which completed only the first half of the heat treatments, i. e., heated only up to 620°C.

The tests have shown that, for the specimens which completed the whole course of the heat treatments, crystallization increases mechanical strength of the specimens, and the relation between the average grain size of the constitiuent crystallites (d) and the mechanical properties (M) (both of the bending strength and Vickers hardness) is given by the equation,

$$M = \text{const} \cdot d^{1/2}.$$

For the specimens heated up to 620°C, partial crystallization of the glass phase was found to increase the mechanical strength of the specimens but in somewhat more complex way. This was attributed to the effects of glass phase still remaining in considerable amounts (60%) in the specimens.

Behavior of Cerium Ions in Glasses Exposed to X-rays

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Yogyo Kyokaishi (Journal of the Ceramic Association, Japan), **68**, 169 (1960)

Silicate glasses exposed to high-energy radiation develop three visible absorption bands similar to the F- and V-band in alkali halide crystals (R. Yokota, *Phys. Rev.*, **91**, 1013 (1953), **95**, 1145 (1954), **101**, 523 (1956); A. Kats and J. M. Stevels, *Philip Res. Report*, **11**, 103, 115 (1956)). The function of cerium in suppressing formation of these bands were studied spectrophotometrically in glasses of composition 20 R_2O, 10 BaO, 70 SiO_2, and 0.03 to 0.3 mol% CeO_2 (R_2O: Li_2O, Na_2O, K_2O).

Glass specimens of about 0.1 mm in thickness were irradiated with X-rays of 42 kV, 10mA, and changes of their absorption spectra in the range 230 to 800 mμ were measured with the Beckman photoelectric spectrophotometer. As the absorption changes were found to be caused not only by color centers but also by other sources such as the valency change of cerium ion, the change due to color centers were separated from the others by heating the irradiated specimen at 150°C for 30 min.; the decrease in absorption intensity by the heating was taken as the absolute change of the absorption due to formation of color centers.

The experimental results showed that trivalent cerium ions suppress development of the three absorption bands equally; i. e., trivalent cerium ions are effec-