Rapid crystal growth in a glass at room temperature.

BY

OLAV H. J. CHRISTIE

During the microscopical examination of the crystals mentioned in the following note, I have been able to follow growth of nepheline crystals at room temperature during 3 days. The growth of the crystals is shown in Figs. 1 and 2.

Fig. 1.

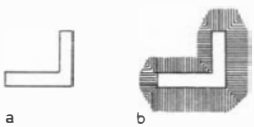

Fig. 2.

Fig. 1. a) initial stage, formed at 1015° C, b) crystal after one day at room temperature, c) end stage, obtained in 3 days.
Fig. 2. a) initial stage, formed at 1015° C, b) crystal after heating up to 700° C for 15 minutes.

Fig. 3. Nepheline from a corroded refractory stone.

It has not been possible to analyze the crystals as they are small and almost black, due to Fe_2O_3 absorbed from the surrounding glass. (Table 1 in the following note). In all probability we are dealing with nepheline. The fibrous form of nepheline is shown in Fig. 3, well known from samples of corroded glass furnace bricks.

It has not been possible to repeat the rapid growth at room temperature. I have made more than 50 attempts, but all the experiments have been unsuccessful. I have been able, however, to reproduce the initial stage in one case, and the end form in numerous cases. By heating the initial stage to ca. 700° C for 15 minutes, the fibrous form was developed. Normally the growth of the crystals in the studied glass is exeedingly slow at this temperature.

Possible sub solidus phase borders in the corundum field of the system SiO_2—Al_2O_3—Na_2O

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OLAV H. J. CHRISTIE

Crystals formed in a glass taken from the surface of an industrial glass tank furnace refractory brick of the melting zone have been studied. The results indicate the presence of two, possibly three, sub solidus phase borders in the corundum field of the SiO_2-Al_2O_3-Na_2O diagram.

The top of the furnace was made of «Silicastones», containing ca. 98 % SiO_2. The alkaline vapors from the glass batch condence on the ceiling and cause the formation of a SiO_2-Na_2O glass. The viscosity of this glass decreases as the Na_2O content increases, and finally it will run down to the walls of the furnace. The wall bricks, having a composition according to Table 1a, will be corroded by the SiO_2-Na_2O glass and add Al_2O_3 to it. The studied glass, thus formed, had a composition according to Table 1b.

	a	b
SiO_2	33 %	58,3 %
Al_2O_3	67 %	27,0 %
Fe_2O_3.		0,3 %
CaO		1,6 %
Na_2O		12,9 %
	100	100,1

Table 1, chemical composition, a) of the unattacked refractory stone, b) of the studied glass.