Some Physical Properties of Glass-ceramics and Their Relation to Microstructure

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Tashiro, Megumi ...[et al]. Some Physical Properties of Glass-ceramics and Their Relation to Microstructure. Bulletin of the Institute for Chemical Research, Kyoto University 1964, 42(5): 351-365

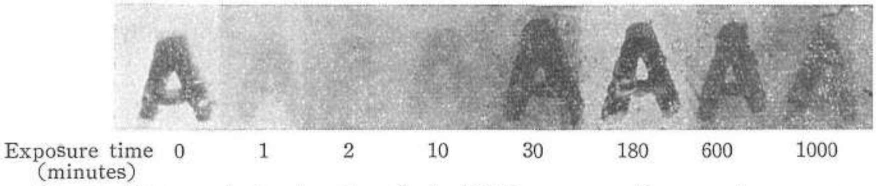

Fig. 3. Photograph showing the effect of U. V. exposure time on transparency of the glass heated at 620°C for 60 minutes.

crystal grain of the resulting opaque glass-ceramics the smallest. The transparency could not be obtained when the U. V. exposure time was made longer or shorter than 180 minutes. Fig. 3 shows photographs of the specimens subjected to these heat treatments. Their thickness was 2.0 mm. The condition of heat treatment was the same for all the specimens, i. e., first at 510°C for 30 minutes for formation of gold colloids and then at 620°C for 60 minutes for formation of lithium metasilicate crystallites. The specimens in Fig. 3 are placed on a sheet of paper marked with letters 'A' so that qualitative measurement of the degree of their transparency could be made. The specimen not exposed to U. V. ray (the exposure time, 0) is colorless and transparent because it contains neither gold colloids nor lithium metasilicate. With increasing U. V. exposure time opacity of the specimen increases because the lithium metasilicate crystallites nucleated by gold colloids are separated out from the glass phase. When the U. V. exposure time exceeds 10 minutes, opacity begins to decrease, reaching a minimum at the 180 minutes' exposure time. The specimen exposed to U. V. ray for 180 minutes is very transparent though its color is deep red due to precipitation of gold colloids. When the exposure time exceeds 180 minutes opacity again increases with increasing exposure time.

Fig. 4 shows light transmission curves of the specimens shown in Fig. 3.

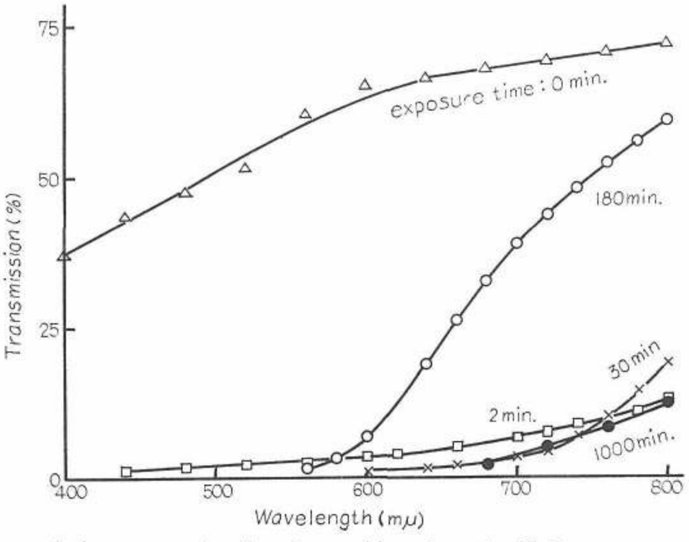

Fig. 4. Transmission curves for the glass subjected to the U. V. exposure and the heat treatment. Lithium metasilicate crystallites are precipitated within the glass. (Specimen thickness : 2.0 mm).