

Chapter V

Conclusion

From this study of two kinds of glass; borosilicate glass and soda-lime-silicate glass, prepared to be glass powder and pressed into cylindrical shape of specimen, following summary is given:

1. The glasses can be prepared into powder by grinding with planetary mill. The powder can be formed to any shape with proper binder which is PVA binder in this experiment. The specimen can be shaped with a pellet press. The porosity of specimen before firing is about 30 - 45 %. Thus, final shrinkage after firing is about 30 - 45 % also.

2. The firing was studied in 2 ways, in the annealing furnace and in the long - range dilatometer. In the annealing furnace, the shrinkage was measured after firing; the density of the specimen was observed by using Archimedes method. At higher temperature, the normal density of glass is almost reached. Yet, closed porosity of $\approx 1.5\%$ prevailed. When the glass specimen is fired, trapped pores cannot escape from the inside of the specimen.

In the self - constructed long - range dilatometer, the shrinkage was measured in 2 ways: Shrinkage was measured under a constant heating rate of 5 K/min until a certain upper temperature corresponding to $\log \eta \approx 6$ was reached. Alternatively, shrinkage was measured at a constant temperature for 3 hours. The shrinkage of borasilicate glass and soda - lime - silicate glass started at T(8.8) and was completed at T(6.7). The behavior of shrinkage

of specimen at constant temperature follow an Avrami - Erofe'ev type kinetics, from this, the shrinkage can be calculated from the formula,

$$S_{cal} = S_{\infty} [1 - \exp -(t/\tau)^N]$$

and the time demand of sintering can be calculated from the formula,

$$t_{xy} = \tau [-\ln(1 - 0.xy)^{1/N}]$$



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย