

References

1. Hench, L.L. Inorganic Biomaterials. in Interrante, L.V.Casper, L.A., and Ellis, A.B. (ed.) Materials Chemistry: An Emerging Discipline. Washington DC: American Chemical Society, 1995.
2. Scholze, H. Glass nature, Structure, and Properties. Translated by Lakin, M.J. New York:Springer-Verlag, 1991, p. 5. cited in Simon, F. Fuenfundzwanzig Jahre Nernstscher Warmesatz Ergeb.exakt. Naturwiss. 9 (1930): 222-274.
3. Scholze, H. Glass nature, Structure, and Properties. Translated by Lakin, M.J. New York: Springer-Verlag, 1991.
4. Uhlmann, D.R. Glass formation, a contemporary view. J. Amer. Cer. Soc. 66 (February 1983): 95-100.
5. Scherer, G.W. Glass Formation and Relaxation. In Zarzycki (Vol.ed.) Materials Science and Technology, Vol.9: Glasses and Amorphous Materials. Weinheim: VCH, 1991.
6. Uhlmann, D.R., Yinnon, H. Glass Science and Technology, Vol.1: Glass-forming systems. New York: Academic Press, 1985
7. Sales, B.C. Phosphate glasses. MRS Bulletin. (June 16/August 15, 1987): 32-34
8. Ropp, R.C. Studies in Inorganic Chemistry 15: Inorganic Polymeric Glasses. New York: Elsevier, 1992.
9. Abe, Y., and Hosono, H. Materials Science Monographs 52: Inorganic Phosphate Materials. Tokyo: Elsevier, 1989.

10. Voegel, W. Chemistry of Glass. Translated by Kreidl, N. Columbus, Ohio: The American Ceramic Society, 1985.
11. Strnad, Z. Glass Science and Technology 8: Glass-Ceramic Materials. Translated by Madeleine, S. Prague: Elsevier, 1986
12. Christian, J.W. Physical Metallurgy. Amsterdam: North-holland Publishing, 1970, p. 479 cited in Volmer, M., Weber, A. Z. Physik. Chem. 119 (1925) and Becker, R., Doering, W. Ann. Phys. 24 (1935).
13. Porter, D.A., Easterling, K.E. Phase Transformations in Metals and Alloys. London: Van Nostrand Reinhold (UK), 1981
14. Wagner, R. and Kampmann, R. Homogeneous Second Phase Precipitate. In Haasen, P. (Vol.ed.) Materials Science and Technology. Vol.5: Phase Transformation. Weinheim: VCH, 1991.
15. Kingery, W.D., Bowen, H.K., and Uhlmann, D.R. Introduction to Ceramics. Singapore: John Wiley & Sons, 1991 cited in Jackson, K.A. Progress in Solid State Chemistry vol. 3 New York: Pergamon Press, 1967
16. Strnad, Z. Glass Science and Technology 8: Glass-Ceramic Materials. Translated by Madeleine, S. Prague: Elsevier, 1986 cited in Wilson, H.A. Phil Mag. 50, 1900 and Frenkel, J. Fizik. Z. 1, 1932
17. Hillig, W.B., Turnbull, D. J. Chem. Phys. 24, (1956): 914.
18. Speyer, R.F. Thermal Analysis of Materials. New York: Marcel Dekker, 1994.

19. Henderson, D.W. Experimental analysis of non-isothermal transformations involving nucleation and growth. J. Thermal. Anal. 15 (1979): 327
20. Augis, J.A., Bennett, J.E. Calculation of Avrami parameters for heterogeneous solid state reactions using a modification of the Kissinger method. J. Thermal. Anal. 13 (1978): 283-292.
21. Bansal, N.P., Doremus, R.H., Bruce, A.J., Moynihan, C.T. Kinetics of crystallization of $ZrF_4\text{-BaF}_2\text{-LaF}_3$ glass by Differential Scanning Calorimetry. J. Amer. Cer. Soc. 66 (April 1983): 237
22. Cormia, R.L., Mackenzie, J.D., and Turnbull, D. Kinetics of melting and crystallization of phosphorus pentaoxide. J. App. Phys. 38 (August 1963): 2239-2244.
23. Abe, Y. Kinetic studied on crystallization of calcium metaphosphate glass. Yogyo Kyokai Shi. 81(November 1973): 471- 476.
24. Abe, Y., Arahori, T., and Naruse, A. Crystallization of $Ca(PO_3)_2$ glass below the glass transition temperature. J. Amer. Cer. Soc. 59 (November-December 1976): 487-490.
25. Abe, Y., Hosoe, M., Kasuga, T. High-strength $Ca(PO_3)_2$ glass-ceramics prepared by unidirectional crystallization. J. Amer. Cer. Soc. (November 1981): C189-C190.
26. Abe, Y., Kihara, S., Watanabe, A. Calcium phosphate glass-ceramic crown prepared by lost-wax technique. J. Amer. Cer. Soc. (June 1984): C100-C101.

27. Watanabe, A., Imada, Y., Kihara, S. Periodic accumulation of voids observed in calcium phosphate glass-ceramics. J. Amer. Cer. Soc. (June 1984): C100-C101.
28. Matsubara, E., Waseda, Y. Structure study of binary phosphate glasses with MgO, ZnO and CaO by X-ray diffraction. J. Non-Cryst. Solid. 103 (1988): 117-124.
29. Chin-Wang, H., Ts'en-Lou, L., Jinn-Shing, L., Jia-Heng, Y. Kinetics study of apatite ($\text{CaO}/\text{P}_2\text{O}_5$) glass-ceramics , contain Al_2O_3 . Proceedings of the First international Symposium on Apatite, (July 1991): 53-58.
30. Nan, Y., Lee, W.E., and Jame, P.F. Crystallization behavior of $\text{CaO-P}_2\text{O}_5$ glass with TiO_2 , SiO_2 , and Al_2O_3 additions. J. Amer. Cer. Soc. 75 (June 1992): 1641-1647.
31. Goldstein, M. and Davies T.H. Glass fibers with oriented chain molecular. J. Amer. Cer. Soc. 38 (July 1955): 223-226.
32. Milberg, M.E. and Daly, M.C. Structure of oriented sodium meta phosphate glass fibers. J. Chem. Phy. 39 (December 1963) :2966-2973
33. Miller, P.J., Exarhos, G.J., and Risen, W.M. Vibrational spectral study of molecular orientation in vitreous fibers. J. Chem. Phy. 59 (September 1973): 2796-2802.
34. Stockhorst, H. and Brueckner, R. Structure sensitive measurements on phosphate glass fibers. J. Non-Cryst. Solids. 85(1986) :105-126
35. Levin, E.M., Robbins, C.R., McMurdie, H.F. Phase diagrams for

ceramists (Vol.1) 1969 Supplement. Vol.4. Columbus, OH: The Am. Ceram. Soc. (Figure 2304).

36. Aoki, H. Science and Medical Applications of Hydroxyapatite. Tokyo: Takayama Press System Center, July, 1991



สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย



APPENDICES

สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย

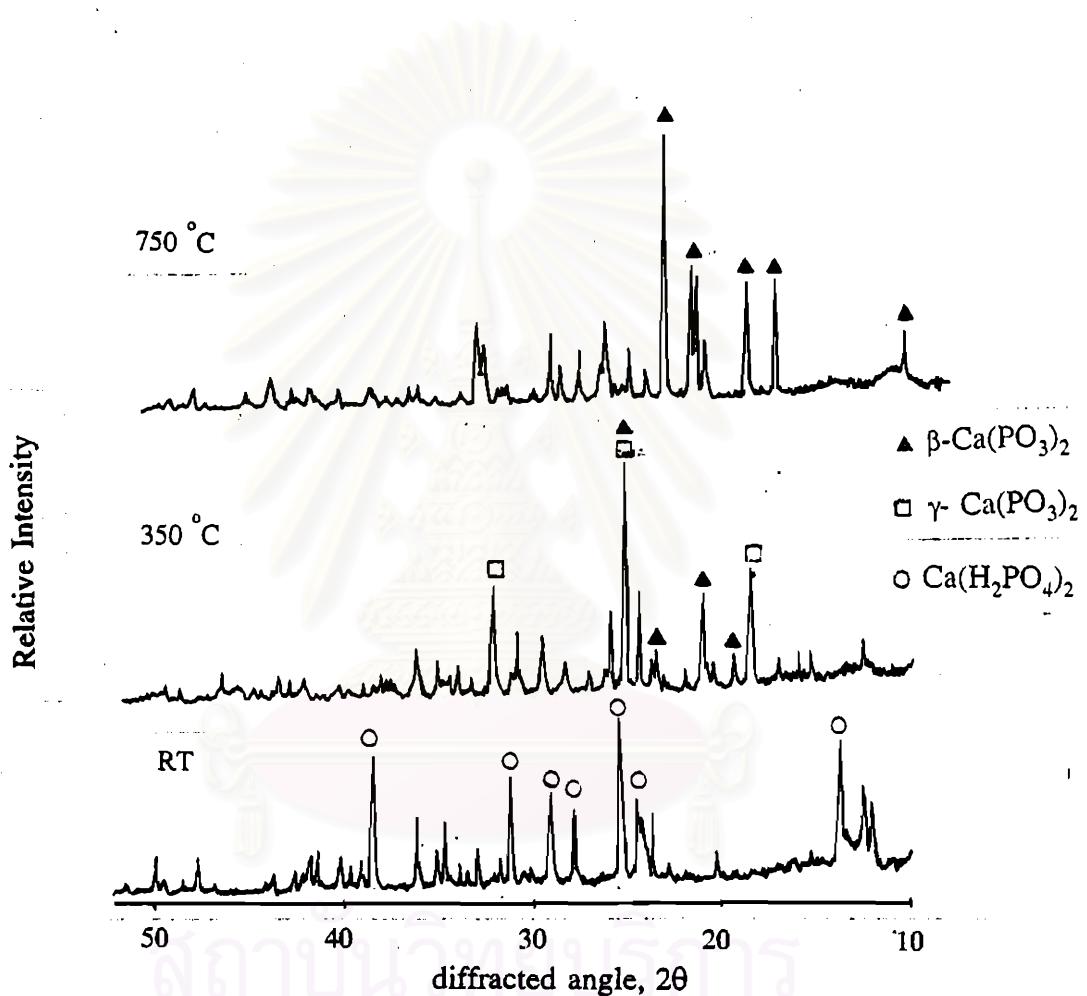
Appendix A

glass JM-753		T in °C	log (ETA)
T1	775.4	527.6	14.5
T2	947.1	550.0	13.0
T3	1320.9	567.8	12.0
		588.5	11.0
L1	6.0	612.7	10.0
L2	4.0	641.7	9.0
L3	2.0	676.7	8.0
A	-1.3999	693.0	7.6
B	3429.1	720.2	7.0
T ₀	311.9	775.4	6.0
		847.8	5.0
T _{liq}	921.0	893.2	4.5
		922.2	4.2
		947.1	4.0
		1011.9	3.5
		1091.5	3.0
		1191.5	2.5
		1320.9	2.0
		1494.9	1.5

**สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย**

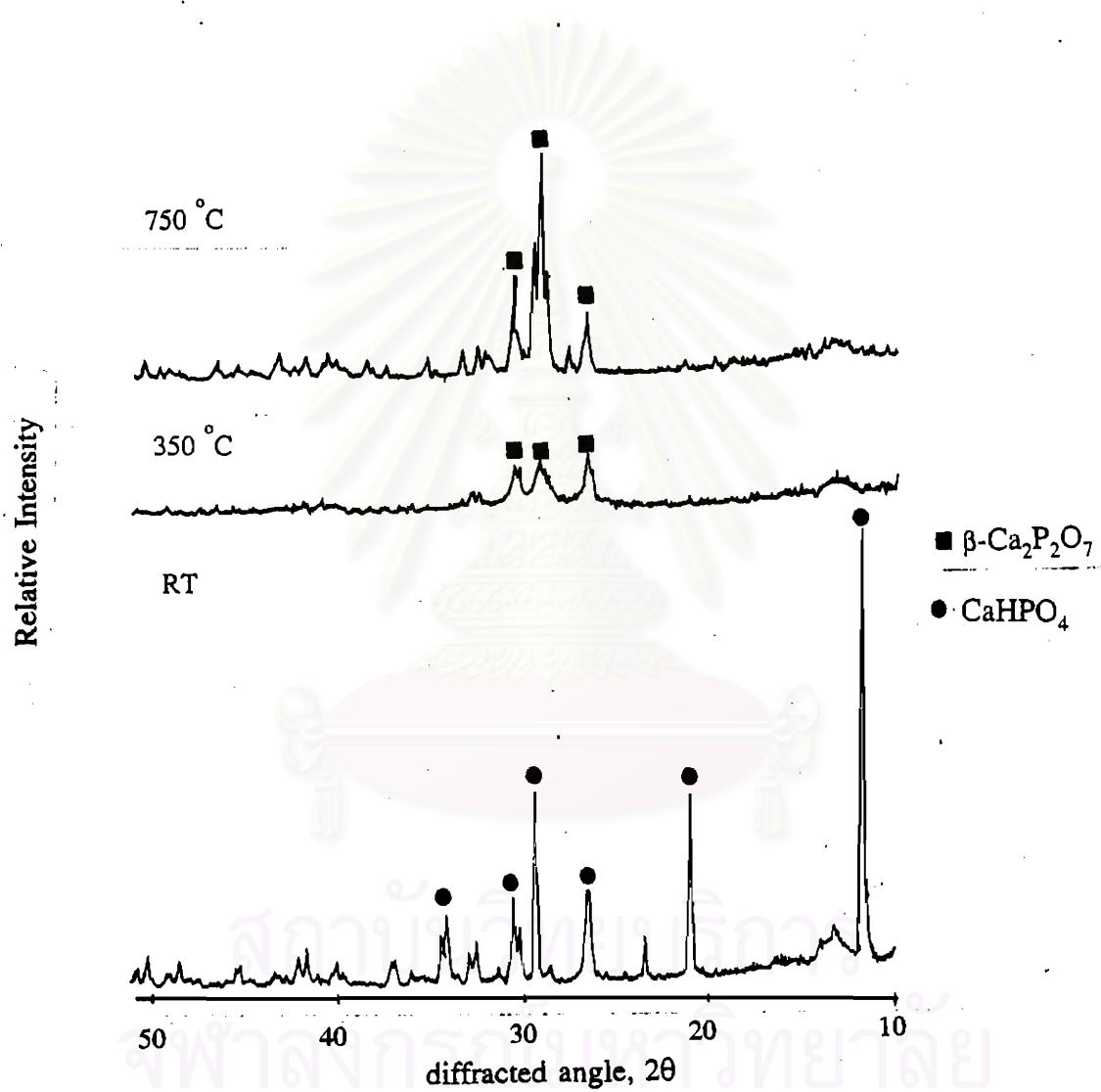
Appendix B

XRD pattern of $\text{Ca}(\text{H}_2\text{PO}_4)_2$



Appendix C

XRD pattern of CaHPO_4



Vita

Miss Naruemon Suwattananont received her Bachelor Degree of Science in Chemistry from Faculty of Science, Chiang Mai University in 1994.

She began her Master study in Ceramic Technology at department of Materials Science, Faculty of Science, Chulalongkorn University in June 1994 and completed the program in May 1997.



สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย