CHAPTER V

CONCLUSIONS

Zinc hydrometallurgy waste and glass cullet from float glass (clear cullet) and bottle (amber cullet) were used as raw materials for production of glass-ceramics in this study.

1) Glass-ceramics obtained from non-melting process contained numerous porosities inside of specimens resulted in low bending strength.

2) Pore size of the glass-ceramics decreased when particle size of raw materials was decreased.

3) Bulk density of glass-ceramics increased with increasing of heat treatment temperatures.

4) The colors of glass-ceramics depended on proportions of Zn-waste, the more percent weight of Zn-waste mixed, the darker brown of sample occurred. Intense color was due to an increasing of amount of Fe_2O_3 from Zn-waste.

5) Glass-ceramics obtained from melting and sintering process showed better properties than the glass-ceramics obtained from non-melting process.

6) Sintering at 850°C revealed crystal phase formations. The peaks of diopside, cristobalite, and esseneite-sodian existed in XRD patterns of glass-ceramics contained Zn-waste and clear cullet. For glass-ceramics contained Zn-waste with amber cullet, diopside, wollastonite, and cristobalite presented in this mixture.

7) At 60 w% of Zn-waste in the composition mixed with clear cullet and sintered at 850°C, glass-ceramics yielded the maximum strength (~86.5 MPa).

8) Pore size of glass-ceramics increased with increasing sintering times as a result of densification process.

9) The bending strength increased from 86.5 to 96.5 MPa after sintering for 4 hours.

10) Artificial marbles were successfully developed by using Zn-waste and glass cullet and the properties were satisfied the requirement for Thai Industrial Standard of marble slabs.