Chapter V

Conclusion

Fast automatic recording in the investigation of the melting of glass batch blankets is possible to perform. The fast automatic recording requires an analog to digital card, an amplifier card, and a computer. The modes of connection is important. It controls the quality of the data. From $Hz = 1/RC$ and $R_{im} = 1/\omega C$, high electric capacity should be used to decrease the overall noise and a Zener diode should be used to cut off isolated high peak noise. After the signals (from thermocouple and electrodes) passes through the circuit, the computer detects the signal by converting the analog signal to digital signals. Then, data processing by software is used to smooth the data again.

Some shortcomings of previous work are overcome. First, the batch loading time is decreased from 3-5 minutes to 30-45 seconds by changing the loading method. So the earliest phase of batch melting could be investigated, too. Secondly, the cullet melt is heated independently by an electric furnace.

The small scale test tells the accuracy of the fast automatic recording instruments and the experiments. Temperature of primary melt formation are detected within ± 1 to 2 K.

In the large scale tests, cullet dramatically decreased the melting time, although the melting temperature increased. Cullet melt shows a mere physical melting behavior. Chemical heat is not required in this melting process. The heat is used to decrease the viscosity of the cullet. The batch without cullet requires

chemical heat. Nevertheless, eutectic melting leads to an early occurrence of primary melt.

Recommendation

Due to the increased electrical conductivity of refractory brick and ceramic crucibles at high temperature, the electric current from heating elements can flow around the furnace. A 30 Volt level could be detected at the furnace periphery with respond to common ground. This basic interference can be kept under control by applying high current and low voltage heating.