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# Melting of the batch containing the polymer-coated cullet

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Over the past decade, the glass bottle industry has made considerable progress in developing light glass bottles in order to keep its market that has been challenged by both plastic and metallic bottle producers. One of the major developments is that the polymer coated light glass bottles have been developed, which are entering the market. This type of modern glass bottle is much lighter than the traditional light glass bottles, since the polymer coating increases the mechanical strength due to avoiding the appearance of the flaws on the surface of the bottles so that the wall thickness, and hence the weight of bottle can be largely reduced. However, for the economical and ecological reason such polymer-coated glass must be fully recyclable. One way to do this is to collect and use the bottles as raw material (cullet) of batch for producing new glass bottles. However, a serious problem during re-melting of the polymer-coated colourless bottles is the disturbing colouration of bottles and hence the decrease of transparency of glass since reduction of the Fe3+ (impurity in glass) by burning of polymer coating layer of cullet. In addition, the burning of polymer would negatively influence the refining quality of glass melting process, and hence increase the defects of the final product. To overcome the negative effect, systematic re-melting experiments of the polymer-coated cullet have been performed to observe the influences of melting conditions on the redox state of the melt and the degree of colouration of glasses. The results show the following regularities: 1) A critical temperature exists for charging cullet into the furnace, above which the disturbing colouration of glasses becomes more intense with increasing temperature due to the increase in reduction degree of the melt. 2) The disturbing colouration becomes rapidly worse with increasing the quantity of cullet for the same thickness of polymer coat, or with increasing the coating layer for the same fraction of cullet in batch. 3) The extent of disturbing colouration depends on the type of the coating polymer, especially at the low temperature of charging. 4) The amount of oxidizing agents (e.g. NaNO3) and the amount of decolourizing agents (e.g. ZnSe) exert only a very limited effect on the disturbing colouration.