

Processing Vein Quartz in Badulla Area to Suit Manufacturing Chemically Reinforced Glasses

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Abstract

Chemically reinforced glass, commercially known as tempered glass has a high global demand with the rapid increase in the usage of touch-screen type mobile phones and tablets. To maintain a high quality and to enable improvements of these devices the resolution, clarity and durability of tempered glass has to be improved and therefore, the selection of quality raw silica for tempered glass has become critical. Sri Lanka is one of the main exporters of silica to the world market and currently, Sri Lankan supplies mainly consist of crushed and powdered bulk unprocessed raw material. In this background, it would be prudent to export semi-processed quartz as raw material for chemically reinforced glass. The requirements for chemically reinforced glass is a minimum value of 99.8 %, SiO₂ and the maximum impurity levels of 9 ppm of Fe₂O₃ and 350 ppm of Al₂O₃ with the size requirement being 75-300 microns. In this study, sources for the production of raw material for the production of chemically reinforced glass was investigated using various types of vein quartz originating from quarries situated at Badulla in Sri Lanka. Milky, Smokey, Transparent, Rose, Mica associated and Feldspar associated quartz obtained from 7 quarries were investigated. Samples were analyzed using Atomic Absorption Spectrophotometer (AAS) and Inductively Coupled Plasma (ICP) techniques for trace elements. Results of the chemical analysis showed a markedly low iron content with less than 15 ppm in transparent quartz, less than 25 ppm in milky quartz, less than 30 ppm in smokey quartz, less than 35 ppm in rose quartz, less than 30 ppm in mica associated quartz and less than 300 ppm in feldspar associated quartz. More than 700ppm of Al₂O₃ content was observed in feldspar associated quartz. Cr content in rose quartz was more than 700 ppb and more than 800 ppb in mica associated quartz. Smokey quartz showed a high Ni and Al₂O₃ contents. Milky and transparent quartz in the observed quarries showed the lowest trace element contents and their natural quality close to the requirements of chemically reinforced glass and SiO₂ levels are higher than 99.8%. Further results obtained using an industrial scale pilot plant show a significant reduction of Fe content, less than 5 ppm occurring in milky quartz with size reduction carried out followed by magnetic separation and removal of fraction less than 75 micron. Processed transparent quartz and milky quartz in Badulla area can directly be exported as raw material for chemically reinforced glass.

Keywords: Silica, Tempered Glass, Vein quartz