Purification of Low Grade Quartz Bearing River Sand

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The demand for the high-grade quartz is increasing rapidly with the advancement of semiconductor and photovoltaic industries. Therefore, it is essential to enhance the purity of low grade quartz. Quartz bearing gravel, quartzite and, river and beach sand are the major low-grade silica sand deposits in Sri Lanka. In this study, a method was investigated to remove impurities in quartz bearing river sand depending on its mode of occurrence. Microscopic analysis implies that the impurities in the silica sand are present as mineral grains, coatings, interlocking grains and inclusions. In the physical purification process, sieving was carried out to separate river sand according to the grain size. The highest weight percentage of river sand is in the size range between 0.5 and 0.15 mm. This portion consists of more than 90% of quartz. Therefore, physical separation, depending on the grain sizes, can effectively use to remove the mineral grains present as impurities in quartz grains. Panning together with scrubbing and washing was carried out to remove the clay particles, heavy minerals and other undesirable materials present in the river sand. A chemical purification of physically separated river sand was carried out by acid leaching with 5 - 30 vol. % of HCl solutions in the temperature range between 27 and 100 °C. The mineralogical analysis and X-ray diffraction analysis imply the possibilities to remove iron oxide coating from the surface of quartz grains with low concentration of HCl, at low temperature. Accordingly, this physical separation and chemical treatment process is a more effective method to purify the low-grade river sand suitable for the advanced technological applications.

Keywords: Low grade quartz, Impurity, Purification, Acid leaching

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