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ABSTRACTS

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PURIFICATION OF SILICA SAND DEPENDING ON MODE OF OCCURRENCE OF IMPURITIES

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Silica sand deposits of coastal areas of Sri Lanka are presently being mined to provide raw material for glass industry. However, detailed investigations on the purification of these silica sand deposits through considering the mode of occurrences of impurities such as coating around quartz grains are not recorded. Therefore, this study focused to identify the types of impurities in silica sand and develop methods to remove them depending on their mode of occurrence. Sieve analysis and mineralogical analysis were carried out to study the particle size distribution and mode of occurrences of impurities in silica sand samples (n = 3). Then, the particle size separation, density separation while scrubbing was performed. Chemical purification of physically separated silica sand was carried out by acid leaching with 5 - 30 vol.% of HCl solutions in the temperature range between 27 and 100°C.

Grain size and mineralogical analysis showed that about 80% of the silica sand was in the particle size range of 0.15 mm to 0.5 mm and consists of more than 90% of quartz. The fine sieve fractions (0.125 mm, 0.063 mm and pan) contained 50 to 70% of heavy minerals grains. Therefore, particle size ranges of 0.15 mm to 0.5 mm are the most suitable size fractions to separate high percentage of quartz. Impurities were also present as iron and/or clay coating (30%) around quartz grains and as inclusions (8%) in quartz grains. The physical separation process performed in this study; the density separation along with scrubbing, can be effectively used to remove the organic debris, clay coating around the quartz grains and heavy minerals. 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 silica sand suitable for advanced technological applications.