VALUE ADDITION TO LOCAL VEIN QUARTZ IN PRODUCING INDUSTRIAL GRADE SILICA

Supun Sashiendra Pathirage

(158007M)

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Department of Earth Resources Engineering

University of Moratuwa
Sri Lanka

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DECLARATION

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Signature of the supervisor: Date:

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Name of the supervisor: Dr. L. P. S. Rohitha

Signature of the supervisor: Date:

ABSTRACT

Applications of high-purity quartz as a raw material in high-tech industry are numerous. A few of them includes semiconductors, microchips, industrial integrated circuits, high temperature lamp tubing, optical fibers, chemically reinforced glass and solar silicon cells. Sri Lanka is rich in quartz mineralization with an abundance of major vein quartz deposits with purity levels over 99.5% of SiO_2. Developing high-tech products requires considerable capital investment, expertise and advance processing technologies which are lacking in developing countries like Sri Lanka. Thus leading to export raw quartz with enforced size reduction of run-of quarry quartz in grit and powder forms to industrialized countries without further value addition. Therefore, an alternative approach is evaluated and recommended to achieve a higher level of value addition by exporting semi-processed and processed industry specific quartz raw material. Chemical composition of major types of vein quartz and mining activities of 7 vein quartz deposits and mass scale quartz processing at a plant located in Badulla district of Uva Province, Sri Lanka have been subjected to study. Critical step evaluation of the process in mining, transport and processing activities was carried out with reference to critical trace elements by using isodynamic magnetic separator, inductively coupled plasma optical emission spectroscopy and atomic absorption spectrophotometer. Results show that colourless quartz contains the lowest trace elements concentration while feldspar-associated quartz has the highest. Lowest Fe, Al, Cr, Mn and Ni levels were observed in colourless and milky quartz in selected deposits. Manual chipping of Fe stains reduce Fe levels of 300 ppm while soil contamination increase Fe levels by 375 ppm. Transportation in iron lined trailer has a possibility to increase Fe levels up to 150 ppm due to contact with rust layer. In processing, Fe levels can be reduced by more than 20 ppm by removing the finer size fraction in each crushing step. Further reduction can be obtained to a level below 9 ppm by dry magnetic separation with 10,000 gauss 24 trays magnetic separators. Through selective mining and exercising quality control in mining, transportation and processing activities, industry specific quartz raw material can be produced.

Key words: Vein quartz, Chemically reinforced glass, Silica

DEDICATED TO SRI LANKANS WHO CONTRIBUTED FOR FREE EDUCATION

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AAS	-	Atomic Absorption Spectrophotometer
BOI	-	Board of Investment
ESR	-	Electron Spin Resonance
FOB	-	Free On Board
GDP	-	Gross Domestic Product
HC	-	Highland Complex
HPQ	-	High Purity Quartz
ICP-OES	-	Inductively Coupled Plasma Optical Emission Spectroscopy
ILO	-	International Labour Organization
NIST	-	National Institute of Standards and Technology
NIR	-	Near Infrared
SiO_2	-	Silicon Dioxide
SRM	-	Standard Reference Materials
VC	-	Vijayan Complex
WC	-	Wanni Complex
XRT	-	X-ray Transmission

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