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Market of high purity quartz innovative applications

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Abstract

The production and distribution of quartz sand for the simplest uses as filters and absorbents, foundry sand, fillers, or abrasives and finally the high-tech industry is first discussed. A special category of ultra-pure quartz is the high quality and high value of experimental glassware in synthetic and analytical chemistry. Information about other high tech products of ultrapure, high added value quartz, particularly optical fibers, silicon manufactured for use in electronics industry and photovoltaic cells is presented next. The mineralogy and natural quartz sources as raw material in industry is described pointing out the alternative uses by the natural and industrial attendant and competitor of quartz, feldspars. With reference to the above basic data of the Greek and international raw quartz production we introduce an ultra-pure quartz production network able to produce finished high-tech products. Useful economic conditions and market design is further developed by discussing economic demands, supply and product quality. We collect primary information, possible sources and relevant representative methods of the industries concerned with ultra-pure quartz leading edge industry. Important companies of ultra-pure quartz and secondary manufacture marketing are listed according to their products of house ware, electronics, optical fibers, efficient solar cells, specific technology of thin films, and integrated circuits for the computer industry.

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1. Marketing requirements of quartz

This research is designed to provide information on quartz resources that can be used further by the industry as a raw material for production of modern commercial products with high demand and added value. It is therefore necessary to know the uses of ultra-pure quartz in the market and recognize products where quartz is the raw material. The aim is to collect and process information, which will ensure a good basis for making business decisions for the companies who market ultrapure quartz and products derived there from. In particular, a systematic collection and evaluation of information about primary mine production of mineral quartz along with information about quartz processing companies is sought. Therefore one should be able to answer the following questions:

- What locations nationwide and in which countries abroad are potential mining and processing targets for quartz?
 - Which markets (industry and craft) have to be addressed and what are the needs of each of them?
 - What quartz amount and what quality can likely be demanded in any specific market?
 - What qualitative and quantitative means and alternative ideas apply in research companies and which new products will create greater interest in the market?
 - What is the best combination of characteristics for each one these new products?
 - What features of contemporary media, e.g. promotion and sales via the internet, are used by the companies?
- At this point is important to review,
- the potential uses of end products
 - the applicable specifications, sales prices and
 - the required quantities at European and international level

The quartz grading criteria are set with reference to the uses, generic characteristics, unit price, quantity production, and combinations thereof. For the ultra-pure quartz production is required the removal of any existing fluid inclusions and produce a final product which may be utilized in glass industry, in manufacturing optical telecommunication fibers and integrated circuits industry (microchips), as well as in the chemical industry. Concerning glass industry we mention the high value-added experimental glassware for scientific synthesis projects or analytical work. All these glass products manufactured using the best quality available glass includes: test tubes, vials for reactions and High-performance liquid chromatography (HPLC) and auto-samplers.

The products of ultra-pure quartz are widely utilized in modern high tech applications, such as optical fibers, semiconductors for the electronic industry, production of silicon cells for use in photovoltaic systems, as well as in industrial catalytic chemistry for the synthesis of catalysts, zeolites and adsorbent materials in general.

Financial terms and market requirements of quartz quality and prices are based on uses of manufactured products but also to national sources of raw materials, the most important of which involve environmental benefits with e.g. the quartz mine waste conversion to industrial resources. To produce one kilogram of silicon (Si) suitable for manufacturing solar cells, it takes about 15 kg pure quartz.

Recycling and green innovation will help the economic development of underprivileged areas in Greece. Here we seek a better knowledge of one of the main industrial uses of ultra-pure quartz, the photovoltaic industry cells analyzing their operating principles. This industrial use is the most cost-effective, the most green and one of the most applicable nationally due to the weather conditions, in Photovoltaic (P/V) parks.

The public awareness of environmental issues and recycling is particularly evident across Europe. It is worth noting that in Germany there is a taxation of € 0.25 for each non-returnable packaging. Conversely, the guarantee fee for each glass bottle is set to 0.08 €, while in Greece is set to 0.07 €, although in practice this value is not always applied. From the preliminary information we have at our disposal on recycling in Greece from 2002, it appears that have been recycled approximately 46,000 tons, or 27% of the total production. By law, this figure was required to reach 60% until 2005. Moreover 80% of the above 46,000 tons waste was coming from the industries themselves and not from consumers. As consumers we should be concerned, informed, and care to act. The effort should be great, well organized and above all, collective.

A basic threat for the quartz product demand is alternative sources of raw materials for High tech quartz utilization such as e.g. photovoltaics. A reduction in the use of ultra-pure quartz may have the effect of disappearance of the market share held by ultra-pure quartz businesses. A similar risk is the potential changes in

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