

## QUARTZ CRYSTAL (INDUSTRIAL)

(Data in kilograms unless otherwise noted)

**Domestic Production and Use:** Industrial cultured quartz crystal is electronic-grade quartz crystal that is manufactured, not mined. In the past, cultured quartz was primarily produced using lascas<sup>1</sup> as raw quartz feed material. Lascas mining and processing in Arkansas ended in 1997. Cultured quartz crystal is produced by two companies in the United States, but production statistics were not available. One of these companies uses cultured quartz crystal that has been rejected during the manufacturing process, owing to crystallographic imperfections, as feed material. The companies may use a mix of cultured quartz and imported lascas as feed material. In the past several years, cultured quartz crystal has been increasingly produced overseas, primarily in Asia. Electronic applications accounted for most industrial uses of quartz crystal; other uses included special optical applications.

Virtually all quartz crystal used for electronics was cultured, rather than natural, crystal. Electronic-grade quartz crystal is used to make frequency filters, frequency controls, and timers in electronic circuits employed for a wide range of products, such as communications equipment, computers, and many consumer goods, such as electronic games and television receivers.

**Salient Statistics—United States:** The U.S. Census Bureau, which is the primary Government source of U.S. trade data, does not provide import or export statistics specific to lascas or electronic and optical-grade quartz crystal, but does report specifically on mounted piezoelectric crystals. The price of as-grown cultured quartz was estimated to be \$280 per kilogram in 2017, unchanged from 2016. Lumbered quartz, which is as-grown cultured quartz that has been processed by sawing and grinding, was estimated to be \$890 per kilogram in 2017, but the price can range from \$20 per kilogram to more than \$1,500 per kilogram, depending on the application. Other salient statistics were not available.

**Recycling:** An unspecified amount of rejected cultured quartz crystal was used as feed material for the production of cultured quartz crystal.

**Import Sources (2013–16):** Although no definitive data exist listing import sources for cultured quartz crystal, imported material is thought to be mostly from China, Japan, Romania, and the United Kingdom.

<b>Tariff:</b> Item	<b>Number</b>	<b>Normal Trade Relations</b> <b>12–31–17</b>
Quartz (including lascas)	2506.10.0050	Free.
Piezoelectric quartz, unmounted	7104.10.0000	3% ad val.

**Depletion Allowance:** 22% (Domestic), 14% (Foreign).

**Government Stockpile:** As of September 30, 2017, the National Defense Stockpile (NDS) contained 7,148 kilograms of natural quartz crystal. The stockpile has 11 weight classes for natural quartz crystal that range from 0.2 kilogram to more than 10 kilograms. The stockpiled crystals, however, are primarily in the larger weight classes. The larger pieces are suitable as seed crystals, which are very thin crystals cut to exact dimensions, to produce cultured quartz crystal. In addition, many of the stockpiled crystals could be of interest to the specimen and gemstone industry. Little, if any, of the stockpiled material is likely to be used in the same applications as cultured quartz crystal. No natural quartz crystal was sold from the NDS in 2017. Previously, only individual crystals in the stockpile that weighed 10 kilograms or more and that could be used as seed material were sold.

### Stockpile Status—9–30–17<sup>2</sup>

<b>Material</b>	<b>Inventory</b>	<b>Disposal Plan</b> <b>FY 2017</b>	<b>Disposals</b> <b>FY 2017</b>
Quartz crystal	7,148	—	—

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**Events, Trends, and Issues:** Demand for quartz crystal for frequency-control oscillators and frequency filters in a variety of electronic devices is expected to remain stable. However, silicon has replaced quartz crystal in two very important markets—cellular telephones and other mobile devices and automotive stability control applications. Growth of the consumer electronics market, for products such as personal computers, electronic games, and tablet computers, is likely to continue to sustain global production of quartz crystal.

**World Mine Production and Reserves:**<sup>3</sup> This information is unavailable, but the global reserves for lascas are thought to be large.

**World Resources:** Limited resources of natural quartz crystal suitable for direct electronic or optical use are available throughout the world. World dependence on these resources will continue to decline because of the increased acceptance of cultured quartz crystal as an alternative material. Additionally, techniques using rejected cultured quartz crystal as feed material could mean a decreased dependence on lascas for growing cultured quartz.

**Substitutes:** Silicon is increasingly being used as a substitute for quartz crystal for frequency-control oscillators in electronic circuits. Other materials, such as aluminum orthophosphate (the very rare mineral berlinite), langasite, lithium niobate, and lithium tantalate, which have larger piezoelectric coupling constants, have been studied and used. The cost competitiveness of these materials, as opposed to cultured quartz crystal, is dependent on the type of application that the material is used for and the processing required.

— Zero.

<sup>1</sup>Lascas is a nonelectronic-grade quartz used as a feedstock for growing cultured quartz crystal and for production of fused quartz.

<sup>2</sup>See [Appendix B](#) for definitions.

<sup>3</sup>See [Appendix C](#) for resource and reserve definitions and information concerning data sources.