

## 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 crystal was primarily produced using lascas<sup>1</sup> as raw quartz feed material. Lascas mining and processing in Arkansas ended in 1997. In 2020, production of cultured quartz crystal was reported and evidence indicated that two companies produced cultured quartz crystal in the United States. However, production data was withheld in order to avoid disclosing company proprietary data. In addition to lascas, these companies may use 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.

<b>Salient Statistics—United States:</b>	<b><u>2016</u></b>	<b><u>2017</u></b>	<b><u>2018</u></b>	<b><u>2019</u></b>	<b><u>2020<sup>e</sup></u></b>
Production:					
Mine (lascas)	—	—	—	—	—
Cultured quartz crystal	W	W	W	W	W
Imports for consumption:					
Quartz (lascas)	NA	NA	NA	NA	NA
Piezoelectric quartz, unmounted	6,280	6,760	16,100	54,600	95,000
Exports:					
Quartz (lascas)	NA	NA	NA	NA	NA
Piezoelectric quartz, unmounted	60,500	55,300	43,400	40,900	42,000
Price, dollars per kilogram:					
As-grown cultured quartz	280	280	300	200	200
Lumbered quartz <sup>2</sup>	890	300	500	500	500
Net import reliance <sup>3</sup> as a percentage of apparent consumption					
	NA	NA	NA	NA	NA

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

**Import Sources (2016–19):** Import statistics specific to lascas are not available because they are combined with other types of quartz. Cultured quartz crystal (piezoelectric quartz, unmounted): China, 76%; Japan, 11%; Switzerland and Russia, 2% each; and other, 9%.

<b>Tariff:</b>	<b>Item</b>	<b>Number</b>	<b>Normal Trade Relations</b>
	Quartz (including lascas)	2506.10.0050	<b><u>12–31–20</u></b> Free.
	Piezoelectric quartz, unmounted	7104.10.0000	3% ad val.

**Depletion Allowance:** 22% (domestic), 14% (foreign).

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**Government Stockpile:**<sup>5</sup> As of September 30, 2020, 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 kilograms 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 2020. Previously, the only individual crystals from the stockpile that were sold were those that weighed 10 kilograms or more and that could be used as seed material.

Material	Inventory as of 9-30-20	FY 2020		FY 2021	
		Potential acquisitions	Potential disposals	Potential acquisitions	Potential disposals
Quartz crystal	7,148	—	—	—	—

**Events, Trends, and Issues:** Rising imports of piezoelectric quartz in the past several years are likely the result of increased demand for vibration sensors such as accelerometers, which are utilized in aerospace and automotive applications. Demand for cultured quartz crystal for frequency-control oscillators and frequency filters in a variety of electronic devices is expected to remain stable. 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 cultured quartz crystal.

**World Mine Production and Reserves:**<sup>6</sup> This information is unavailable, but the global reserves for lascas are thought to be large.

**World Resources:**<sup>6</sup> 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.

<sup>0</sup>Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — 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>As-grown cultured quartz that has been processed by sawing and grinding.

<sup>3</sup>Defined as imports – exports.

<sup>4</sup>Deceased.

<sup>5</sup>See Appendix B for definitions.

<sup>6</sup>See Appendix C for resource and reserve definitions and information concerning data sources.