

April 5, 2021

## Rock-forming Minerals - Quartz



**Figure 1 - Quartz Crystals**

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The theme for the next few postings on this weblog will be rock-forming minerals. There are lots of them, so this theme could carry on for a few months. We'll look only at the most common minerals that people are likely to encounter, if you really want to dig into the subject, I suggest starting with these books:

- Pough, F, 1998, *A Field Guide to Rocks and Minerals (Peterson Field Guides), 5th Ed.*, Houghton Mifflin Harcourt, Boston, MA, USA
- Deer, W., R. Howie, & J. Zussman, 1966, *Introduction to the Rock Forming Minerals*, Longman Group. Ltd., London, U.K.

## Basic Properties of Quartz

Chemically, quartz is silicon oxide or silica. Pure quartz is clear to white, but with impurities and inclusions it can be any of a number of colours including gray, purple, yellow, brown, black, pink, green, and red. It is transparent to translucent and has a typically vitreous [lustre](#). On [Mohs' Hardness Scale](#) quartz has a hardness of seven. When broken, quartz does not generally show [cleavage](#) but does show a characteristic [conchoidal fracture](#). Quartz tends to form hexagonal crystals, as is Figure 1, above.

## Varieties of Quartz

The main varieties of quartz that are found in nature are:

**Standard Quartz:** also called low quartz or  $\alpha$  quartz, is the most common form of quartz. It is stable at normal temperatures and is found in most igneous and metamorphic rocks. Sand and sandstones are mostly made up of this kind of quartz. At high temperatures and pressures, it becomes **high quartz**, also called  $\beta$  quartz.

**Chalcedony:** is the microcrystalline or cryptocrystalline form of standard quartz. The term includes a variety of stones including flint, chert, jasper, and agate as well as chalcedony.

**Tridymite:** is a variety of quartz often found in acid igneous rocks such as obsidian, rhyolite, andesite, trachyte, dacite and tuff. It has slightly different optical qualities than standard quartz and often occurs as twinned crystals.

**Cristobalite:** like tridymite, cristobalite is also found in igneous volcanic rocks such as obsidian, rhyolite, andesite, trachyte, dacite and olivine basalt. **Opal** is a hydrous cryptocrystalline form of cristobalite.

**Coesite and stishovite:** are high pressure/high temperature varieties of quartz formed during events such as meteor impacts.

To get an idea of the conditions under which the various varieties of quartz form, Figure 2 is a phase diagram for silica:

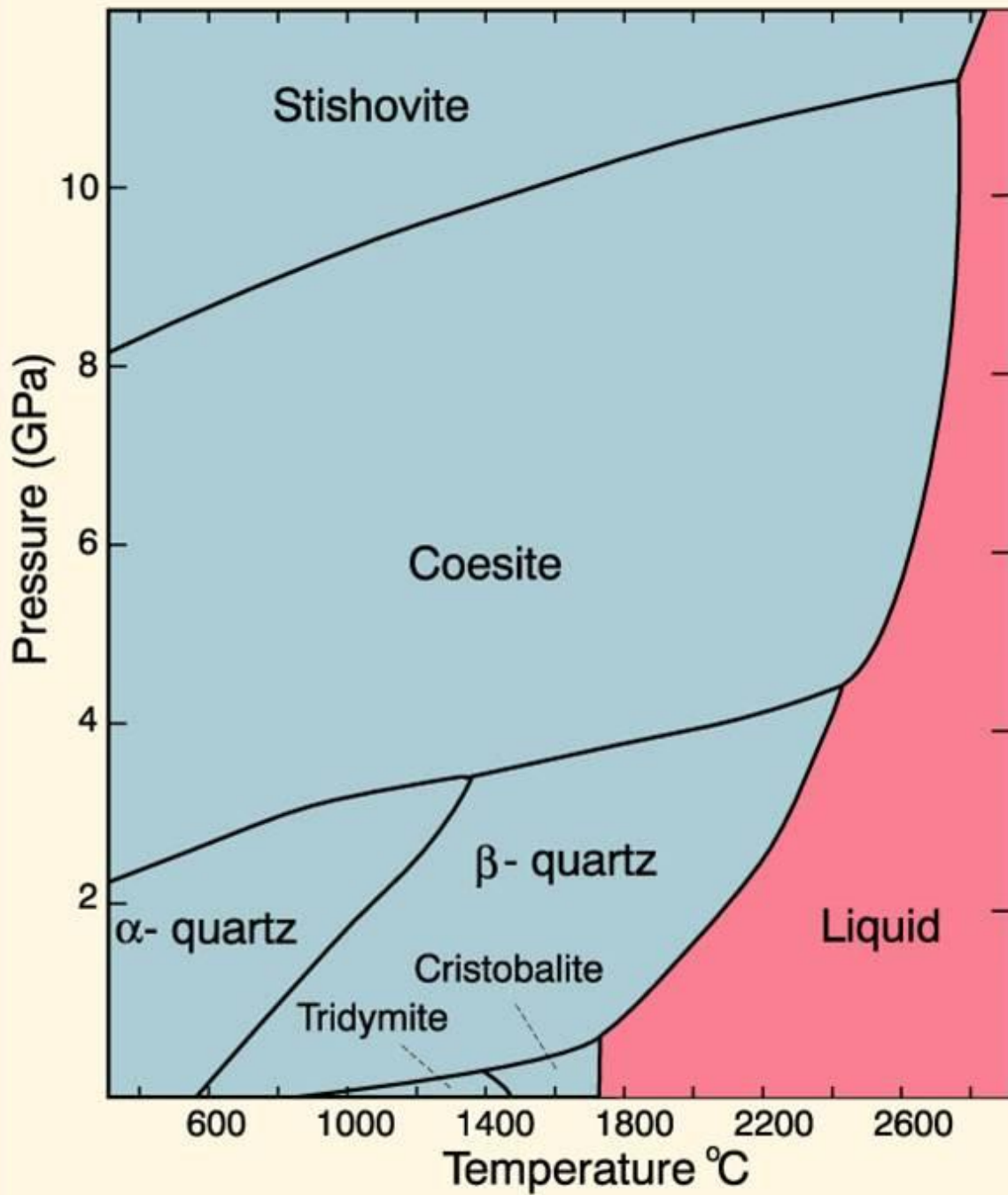


Figure 2 - Silica Phase Diagram

[Perkins & Brady 2021](#)

## The Uses of Quartz

Among the earliest uses for quartz was to make cutting tools. Knives, projectile points, and axes made from quartz varieties were among the earliest cutting tools that people made. The art of [flint knapping](#) is being rediscovered by archeologists, hobbyists and people who are researching [ultra-sharp surgical tools](#). The conchoidal fractures of flint and other forms of chalcedony create some of the sharpest tools known to us, so if you take up flint knapping as a hobby, get some thick leather gloves. You might also want to have some Band-Aids © and Polysporin ©.

In more modern times, flint and steel were commonly used to start fires before chemical matches were in general use. A related use was to spark gunpowder in flintlock guns.

Another one of the original uses of quartz was as jewelry. Semiprecious stones that are varieties of quartz include:

- [Agate](#)
- [Amethyst](#)
- [Ametrine](#)
- [Bloodstone](#)
- [Chrysoprase](#)
- [Citrine](#)
- [Jasper](#)
- [Opal](#)
- [Prasiolite](#)
- [Rose Quartz](#)
- [Smoky Quartz](#)

Other artwork made from quartz includes items such as [crystal skulls](#) and [crystal balls](#). A lot of this kind of artwork has been made to aid spiritual pursuits such as [mediation and divination](#).

Quartz sand is used in applications such as abrasives, masonry (as the sand in mortar), glass, ceramics, enamel ware, and for foundry sand as well as for petroleum recovery by hydraulic fracturing.

Quartz crystals are used in electronics; some of you may have built a [crystal radio](#) at one time or another. Quartz is especially important as the source for the [silicon that is used to make electronic devices](#) like the one are using now. Our electronic village depends on silicon derived from quartz.

## Standard Caveat

I am going to include this caveat in my postings from now on.

The purpose of my weblog postings is to spark people's curiosity in geology. Don't entirely believe me until you've done your own research and checked the evidence. If I have sparked your curiosity in the subject of this posting, follow up with some of the links provided here. If you want to, go out into the field and examine some rocks on your own with the help of a good field guide. Follow the evidence and make up your own mind.