

Formation of Minerals

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CHAPTER

1

Formation of Minerals

Lesson Objectives

- Describe how melted rock produces minerals.
- Explain how minerals form from solutions.

Vocabulary

- lava
- magma
- rocks

Introduction

Minerals are all around you. They are used to make your house, your computer, even the buttons on your jeans. But where do minerals come from? There are many types of minerals, and they do not all form in the same way. Some minerals form when salt water on Earth's surface evaporates. Others form from water mixtures that are seeping through rocks far below your feet. Still others form when molten rock cools.

Formation from Magma and Lava

You are on vacation at the beach. You take your flip-flops off so you can go swimming. The sand is so hot it hurts your feet. You have to run to the water. Now imagine if it were hot enough for the sand to melt.

Some places inside Earth are so hot that rock melts. Melted rock inside the Earth is called magma. **Magma** can be hotter than 1,000°C. When magma erupts onto Earth's surface, it is known as **lava**, as **Figure 1.1** shows. Minerals form when magma and lava cool.

Formation from Solutions

Most water on Earth, like the water in the oceans, contains elements. The elements are mixed evenly through the water. Water plus other substances makes a solution. The particles are so small that they will not come out when you filter the water. But the elements in water can form solid mineral deposits.

Minerals from Salt Water

Fresh water contains a small amount of dissolved elements. Salt water contains a lot more dissolved elements. Water can only hold a certain amount of dissolved substances. When the water evaporates, it leaves behind a solid layer of



FIGURE 1.1

Lava is melted rock that erupts onto Earth's surface.

minerals, as **Figure 1.2** shows. At this time, the particles come together to form minerals. These solids sink to the bottom. The amount of mineral formed is the same as the amount dissolved in the water. Seawater is salty enough for minerals to precipitate as solids. Some lakes, such as Mono Lake in California, or Utah's Great Salt Lake, can also precipitate salts.

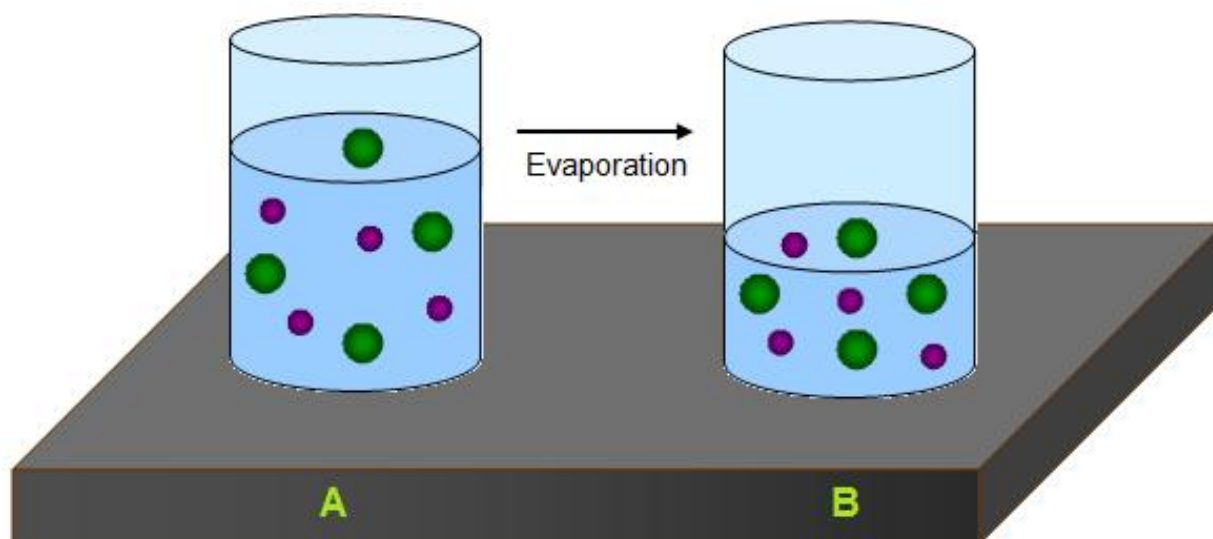


FIGURE 1.2

When the water in glass A evaporates, the dissolved mineral particles are left behind.

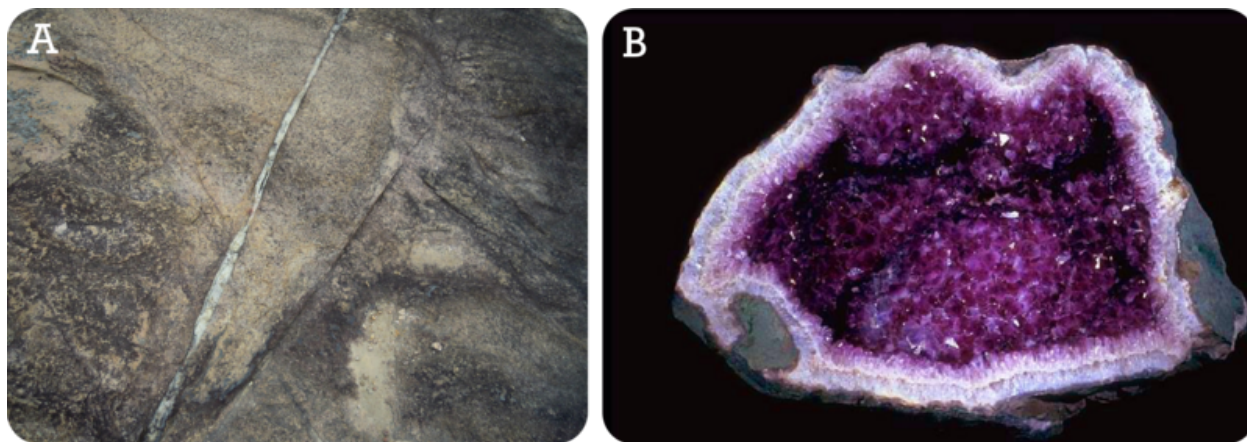
Salt easily precipitates out of water, as does calcite, as **Figure 1.3** shows. The limestone towers in the figure are made mostly of the mineral calcite. The calcite was deposited in the salty and alkaline water of Mono Lake, in California. Calcium-rich spring water enters the bottom of the lake. The water bubbles up into the alkaline lake. The calcite “tufa” towers form. When the lake level drops, the tufa towers are revealed.

**FIGURE 1.3**

Tufa towers are found in interesting formations at Mono Lake, California.

Minerals from Hot Underground Water

Underground water can be heated by magma. The hot water moves through cracks below Earth's surface. Hot water can hold more dissolved particles than cold water. The hot, salty solution has chemical reactions with the rocks around it. The water picks up more dissolved particles. As it flows through open spaces in rocks, the water deposits solid minerals. When a mineral fills cracks in rocks, the deposits are called "veins." **Figure 1.4** shows a white quartz vein. When the minerals are deposited in open spaces, large crystals grow. These rocks are called geodes. **Figure 1.4** shows a "geode" that was formed when amethyst crystals grew in an open space in a rock.

**FIGURE 1.4**

(A) A quartz vein formed in this rock. (B) Geodes form when minerals evaporate out in open spaces inside a rock.

Lesson Summary

- Mineral crystals that form when magma cools are usually larger than crystals that form when lava cools.
- Minerals are deposited from salty water solutions on Earth's surface and underground.

Lesson Review Questions

Recall

1. How does magma differ from lava?
2. What happens to elements in salt water when the water evaporates?

Apply Concepts

3. Describe how minerals can form out of salt water. What are all the steps in the process?

Think Critically

4. You are handed a rock with large and form beautiful crystals. Another rock is made of the same mineral type but the crystals are small and not well formed. How is the way the two sets of that mineral formed different?

Points to Consider

- When most minerals form, they combine with other minerals to form rocks. How can these minerals be used?
- The same mineral can be formed by different processes. How can the way a mineral forms affect how the mineral is used?

References

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