

Metamorphic Rocks

Chapter 6

Metamorphic rocks are rocks of change. The term metamorphic comes from the Greek word *meta* meaning change and *morpho* meaning shape. Igneous, sedimentary, and metamorphic rocks change their crystalline structure and shape when heat and pressure increase in the rocks.

New minerals from old

Heat and pressure usually work together in the metamorphic process causing minerals to destabilize and then recrystallize,

The minerals that were stable in rocks at the surface of the Earth become unstable deeper in the crust.

The minerals within the rocks recrystallize into new minerals that are stable at the new heat and pressure without melting. The new metamorphic rocks have changed in both mineral composition and texture.



The marble Akshardham Temple is in Delhi, India

Fluids add new elements to the rocks that combine with the existing minerals as they recrystallize.

Contact metamorphism

Contact metamorphism occurs when hot magma rising through the crust of the Earth heats the original country rocks through which it moves. Hot magma flows into cracks and joints in the country rocks. Dikes and sills form in the rocks as these intrusions of magma fill the spaces in the rock.

Sometimes the cracks or joints are only a meter wide. In these areas, only a thin circle of rocks around the intrusion will recrystallize. Rocks a few centimeters away from the dike will not recrystallize even though heated by the molten magma.

The effect heat and pressure has on rocks

The amount of heat and pressure applied to the rocks will determine the type of minerals that form within the rocks. Large intrusions of magma moving upward can be a kilometer or more in size.

Scientists have found these large intrusions of magma create circles of recrystallized rock. Each circle is like the rinds of an orange. Large bodies of magma will have three circles of rock with different types of minerals in each circle. The circle closest to the

Name _____

Date _____

Metamorphic Rocks

Quiz 6

Fill in the blanks using words from the Word Bank

1. Anthracite is a metamorphic type of _____.
2. Heat, pressure, and _____ turn igneous and sedimentary rocks into metamorphic rocks.
3. Fluids in rocks _____ up the recrystallization of minerals in metamorphic rocks.
4. Igneous and _____ rocks recrystallize to form metamorphic rocks.
5. Minerals are just _____ to recrystallize in low-grade metamorphic rocks.
6. Minerals _____ in metamorphic rocks when heat and pressure is exerted on rocks.
7. Metamorphic rocks are rocks of _____.
8. Rocks that _____ due to heat and pressure become igneous rocks.
9. Heat and pressure usually work _____ to form new rocks.
10. Graphite and _____ are both made of pure carbon.

Word Bank

speed	recrystallize	change	together	coal
fluids	diamonds	beginning	sedimentary	melt

Modeling Gneiss

Activity 6

Introduction

Gneiss is a high-grade metamorphic rock that forms when continental plates collide. Metamorphic rocks recrystallize as heat and pressure increases when crustal plates collide.

Great mountain chains on land cause a whole series of rocks to recrystallize and form new foliated rocks. The type of metamorphic rock they become depends on the depth the rocks are buried inside the mountains.

This activity demonstrates how geologic forces form gneiss at the base of mountains.

Materials

- ◆ Modeling clay that does not dry out
- ◆ Rolling pin
- ◆ Plastic wrap
- ◆ Table knife



Clay gneiss rock with bands of minerals

Directions

Step 1 Setting up the activity

1. Take the red stick of clay out of its wrapper and begin compressing the stick with your fingers.
2. Flatten the red stick of clay so it forms a rectangle. As you work the clay it will get softer and easier to handle.
3. Place the red clay layer on a piece of plastic wrap on a sturdy table.
4. Repeat steps 1, 2, and 3 with the green, orange and blue clay.
5. The four layers of clay should look like the picture on the next page when you have finished.
6. Place a second piece of plastic wrap on top of the top layer of clay.
7. Press down very hard with a rolling pin in the center of the clay.
8. Roll the rolling pin away from the center of the clay just like you would if this were a pie crust.
9. Repeat this step so the clay layers are pressed together without any holes between the layers.

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