

Where Do Fossil Fuels Come From?

Objective

This activity investigates and models the production of natural gas and oil from ancient life.

Curriculum Focus

Health and Wellness
Science
Social Studies

Materials

- Container to represent the ocean, preferably clear
- Sand or dirt
- Baking soda "plankton"
- Vinegar (20%) and water (80%) "ocean" mixture
- Cup or scoop
- Safety glasses

Key Vocabulary

Physical properties
Odorant
Mercaptan
Combustible

Next Generation Science

Correlations

4-ETS1 - 1
4-ETS1.A
5-PS1 - 1
5-PS1.A
5-ETS1 - 1
5-ETS1.A
MS-ETS1 - 4
MS-ETS1.B



Introduction

Natural gas is a combustible, gaseous mixture of simple hydrocarbon compounds, usually found in deep underground reservoirs in porous rock. The prevailing scientific theory is that natural gas was formed millions of years ago when tiny sea plants and animals were buried by sand and rock. Layers of mud, sand, rock, plant and animal matter continued to build up until the pressure and heat from the overlying sediment turned them into a tar-like substance called kerogen. As temperatures continued to increase and the kerogen continued to heat, more complex compounds of carbon and hydrogen we know as oil were formed. Natural gas is generated at the same time as oil and as it forms, the natural gas molecules migrate from the shale "source rock" into more porous areas such as sandstone. They continue movement to either the earth's surface, where they escape into the atmosphere or they are trapped when their path is blocked by nonporous rock. In the latter case, the impermeable rock layers cause natural gas accumulation to occur.



Procedure

Explain to students that you will be showing them a model of how oil and natural gas form in the ocean. A very similar process takes place on land with plants to form coal.

1. Have students use safety glasses to avoid splashing vinegar water in their eyes. It is harmless but uncomfortable.
2. Have students sprinkle a small amount of sand to cover the bottom of the container. The ocean floor is covered with sediments, and the sand represents these sediments.
3. Next have students sprinkle baking soda over the sand, liberally covering the bottom of the container. This represents plankton (microscopic plant life and animal-like creatures called protists) that have died and settled down to the bottom of the ocean.
4. Explain that over time sediments build up on the ocean floor. Students should completely cover the "plankton" with sand. (You can gently push the sand down with your hands to simulate the pressure and weight of the overlying sediments on the plankton.)
5. The ocean has water in it, so pour some of the vinegar/water "ocean" mixture into the container. Bubbles and foam begin to appear. You can see the bubbles bursting and can hear the gas being released to the air. Point out that this is a sign of a chemical change.



Discussion

Discuss with students how natural gas in the ocean is produced much like in your demonstration, but that the process takes **many** years. In the ocean, plankton is buried under miles and miles of sediment. The weight of this sediment causes high temperature and pressure which "cooks" the plankton deep underneath the ocean floor. The heat and pressure changes the plankton into oil and natural gas. Natural gas floats on top of the oil produced.



To Know and Do More

Go to eia.gov and research where we can find natural gas deposits. Are there natural gas deposits in your state? Find the natural gas pipelines that are located across the United States.

