

**Title:** Coal and the Environment

**Level:** Secondary

**Day/Time:** 15 min.

**KERA Goals:** 1.2

**Objective:** Students will read about how burning coal affects the environment.

**Materials:** No materials necessary.

## **Background Information-- How does burning coal affect the environment?**

Coal is chemically complex fuel. Whenever it is burned, gases are given off and particles of ash, called "fly ash," are released. The sulfur in coal combines with oxygen to form sulfur dioxide, which can be a major source of air pollution if emitted in large enough quantities.

Today, many of the effects of coal burning have been reduced significantly or eliminated. Three basic methods are used to reduce the quantity of pollutants resulting from coal combustion.

The first, a pre-combustion method for removing contaminants from coal, is coal cleaning or "coal beneficiation." In coal cleaning the coal is crushed and screened from impurities. Further processing utilizes the different gravities of coal and impurities to separate them in a liquid medium. Coal cleaning can remove the pyritic sulfur, which can reduce sulfur content by as much as 30 percent.

The second, a post-combustion method, uses flue gas desulfurization systems, commonly called scrubbers. According to the Electric Power Research Institute, scrubbers can remove more than 90 percent of the sulfur dioxide emissions from coal combustion. The flue gas is sprayed with a slurry made up of water and an alkaline agent-- usually lime or limestone. The sulfur dioxide reacts chemically, forming calcium sulfate or calcium sulfite. This is removed and disposed of as a wet sludge. There are currently 134 scrubbers operated by the electric utility industry in the United States.

The final method for reducing or eliminating pollution from coal combustion is the use of electrostatic precipitators or baghouses which are used to remove fly ash. In electrostatic precipitators the particulate matter is given an electrical charge. The charge attracts it to a collector plate, where the particles are collected, preventing their discharge into the atmosphere. In a baghouse, the particulate matter is filtered out as it passes through a series of filters, similar to a household vacuum cleaner.

The two major environmental concerns today dealing with the use of coal are: increase in atmospheric carbon dioxide levels and acid rain. Much remains to be learned about the relationship between fossil fuels (coal, oil, natural gas) and the environment. It is believed that combustion has partially contributed to the increase in atmospheric carbon dioxide levels. Increased atmospheric carbon dioxide levels may result in warmer climates due to the "greenhouse effect." The increase in atmospheric carbon dioxide prevents heat from

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escaping from the earth, thus warming the atmosphere.

The combustion of coal also appears to contribute to acid rain, although precise measures of the scope and seriousness of acid rain are not clear or well understood. What is clear is that further study of the phenomenon is necessary.

There is an interesting riddle to the acid rain phenomenon, and that is that acid rain damage has occurred during periods when sulfur dioxide discharges have declined or remained stable (sulfur dioxide is considered to be the principal cause of acid rain).

Provided by National Energy Foundation.