

The chalcogens, the oxygen group, is located in column 16 of the periodic table. It contains the elements oxygen, sulfur, selenium, tellurium, polonium, and ununhexium (O, S, Se, Te, Po, and Uuh, respectively). These elements all contain six valence electrons and form 2- ions. The physical properties of this group vary dramatically. Oxygen is a colorless gas while sulfur is a yellow solid. Tellurium is a silver metalloid, and selenium is black.

## History

Explore the discoverer's biography, including general facts about his life and anecdotes regarding how he made this particular discovery. Also see other significant scientific discoveries built largely on this concept and other real-world applications in history that may not still be relevant.

### Discoverer/Developer

The term chalcogen was first used by the Wilhem Biltz research group at the University of Hannover in Germany. Sepcifically, one man named Werner Fischer coined this group the chalcogens. In Greek, the word means "copper-former" but this translation does not fit the group. The chalcogens have nothing to do with copper, so the translation is more commonly "ore former."

To get to know who discovered each element in this group, click on the tabs!

For interesting information about cultural connections, visit ChemPrime at

[http://wiki.chemprime.chemeddl.org/index.php/Group\\_VIA:\\_Chalcogens](http://wiki.chemprime.chemeddl.org/index.php/Group_VIA:_Chalcogens) [URL:  
[http://wiki.chemprime.chemeddl.org/index.php/Group\\_VIA:\\_Chalcogens\\_with\\_Cultural\\_Connect\\_ions](http://wiki.chemprime.chemeddl.org/index.php/Group_VIA:_Chalcogens_with_Cultural_Connect_ions)]

## Oxygen

The term oxygen comes from the Greek words *oxys* meaning "acid" and *genes* meaning "producer".

Oxygen was discovered by Joseph Priestley in 1774.

"Priestley was born in England and raised by an aunt after his mother died when he was only six years old. He was educated as a minister, and in 1761 was appointed as a teacher of languages in the Dissenting Academy at Warrington.

"Priestley loved to experiment, and even with a meager salary managed to purchase an air-pump and an electrical machine. In 1766 he met Benjamin Franklin during a visit to London. That meeting encouraged Priestley in his pursuit of a scientific career. He soon began his studies of "fixed air," carbon dioxide, and performed his famous experiment with mercuric oxide that resulted in the isolation of "dephlogisticated air" (oxygen). Without formal training he isolated more gases than anyone before or since.

"Priestley was a liberal clergyman, and his views were not well-received in England. He came to the United States in 1794 and settled in Northumberland, Pennsylvania. He spent the last ten years of his life living quietly in Pennsylvania."- Periodic Table Live! Biographies

### **Sulfur**

Sulfur has appeared in the world in its elemental state since ancient times. It is mentioned in the bible as brimstone.

### **Selenium**

The term selenium originates from the Greek word *selene*, which means "moon".

Selenium was discovered in 1817 by Jöns Jakob Berzelius.

"Berzelius was a Swedish chemist and a professor at Stockholm for over 50 years. It is said that he is entitled to be considered as one of the founders of the science of chemistry. He originated the present day symbols of the elements and the use of formulas for compounds (1814). He pioneered the determination of accurate atomic weights (1817) and contributed to the establishment of Dalton's theory. He discovered cerium in the oxide ceria (1803), selenium (1817), silicon (1823), and thorium (1828).

"He was widely known throughout Europe and drew many students to his laboratory, among them Rose and Wöhler.

"He also wrote a textbook and published annual reports on chemistry. These had a profound effect on chemical thought that extends even to the present time." - PTL! Biographies

## Tellurium

The term tellurium comes from the Latin word *tellus* meaning "earth".

Tellurium was named by Martin Heinrich Klaproth.

"Klaproth, a German chemist, was born in Wernigerode in the Harz on December 1, 1743. After his family was impoverished by a fire, he earned money for schooling by singing in the church choir. At the age of sixteen, Klaproth was apprenticed to an apothecary. He spent five years in that apprenticeship, followed by four years in the public laboratories at Quedlinburg and at Hanover. In 1768, he joined Wedland's laboratory in Berlin as an assistant.

"Klaproth became an assistant to Valentin Rose in 1770. When Rose died only a few months later, Klaproth assumed all the responsibilities of his position. He even acted as father to Rose's two sons.

"Although he never isolated a new element for the first time, Klaproth's excellent analytical work resulted in his discovery of uranium (1789), zirconium (1789), cerium (1803), and titanium (1795). He was well known in his time for the care and exactness of his work. Klaproth is also associated with the discovery of tellurium.

"Klaproth was the first professor of chemistry at the University of Berlin when it was founded in 1810, even though he was sixty-seven years old. He remained at the university until his death in 1817." -PTL! Biographies

## Polonium

Polonium was named after its discoverer's home country of Poland.

Marie Curie discovered this element in 1898.

## Real World Application

Discover processes or disciplines in the natural or man-made worlds that employ the concept.

### Oxygen

Oxygen is very abundant and widely useful. It is the main component of the air that we breathe. Ozone,  $O_3$ , prevents UV rays from entering the atmosphere. It has received a lot of media attention lately with the shift to "green" politics, and there is concern over the depletion of ozone in the atmosphere. Oxygen is a strong oxidizer and is used in rocket fuel.

### Sulfur

Sulfur can be found in gun powder and rubber. Sulfuric acid is used in many industrial processes.

### Selenium

Selenium is used in the production of photocells and solar cells. It is also used in Xerox copying machines. Shampoo sometimes contains a selenium compound.

### Tellurium

Tellurium is used in pigments and lubricants. It is also used to catalyze petroleum processing.

### Polonium

Polonium is unstable and radioactive. There are no known real world applications of polonium.

## Vocabulary

Learn important vocabulary for this concept, including words that might appear in assessments (tests, quizzes, homework, etc.) that indicate the use of this concept.

Important Vocabulary	Term	Context
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## Videos

Browse relevant videos from the Journal of Chemical Education's (JCE) Chemistry Comes Alive! library and other video sources.

### Oxygen

This video is an entertaining way to introduce oxygen and the reactions of the chalcogens.

### Sulfur + Air

Sulfur + Air

## Computer Animations

Experience computer simulators or animations that illustrate the concept discussed here. Many simulators or animations come with worksheets for use in class.

[http://preparatorychemistry.com/element\\_properties\\_flash.htm](http://preparatorychemistry.com/element_properties_flash.htm)

## Summary

Read a summary of the concept, indicating the enduring understanding students should retain after class.

Summary

Students should know the similarities of the elements in this family. They should focus on electron configuration as well as reactivity. Some good questions to ask are: What physical properties, if any, do these atoms share? What chemical properties do they share? What makes this family of elements different than the others?

