



Components

| | NAME | DESCRIPTION | AUDIENCE |
|---|--|---|----------|
|  | <i>Sulfide chemistry</i> teachers guide | This guide describes how practical activities can be used by students to explore the chemistry of sulfides. | teachers |
|  | <i>Investigating sulfides</i> procedure sheet | This practical activity investigates how soils become acidic due to redox processes. See note about safety in the Activity summary. | students |

Purpose

To enable students to **Explore** concepts of oxidation and reduction, within the context of soil chemistry.

Outcomes

Students:

- apply their knowledge of oxidation and reduction reactions to metal sulfide reactions;
- appreciate that redox reactions occur in a variety of everyday phenomena, including acid sulfate soils;
- investigate chemical reactions that involve the transfer of electrons and do not necessarily involve oxygen;
- observe reactions involving metal cations and soluble sulfide ions; and
- observe chemical reactions that lead to the production of acid soils.

Activity summary

| ACTIVITY | POSSIBLE STRATEGY |
|---|--|
| Students are guided through four sections of the procedure, Investigating sulfides. However it may be more appropriate for parts B and C to be done as teacher demonstrations as there are some vigorous reactions involving hydrogen peroxide. | students in small groups, or teacher demonstration for parts B and C |
| Students answer questions within the procedure sheet. | individuals |

Teacher notes

Safety consideration: The activities described in the procedure, Investigating sulfides, should be carried out in a fume cabinet due to the likely production of hydrogen sulfide gas.

It is assumed that students have some background in redox reactions before investigating oxidation and reduction in the context of soil chemistry. They should be familiar with definitions of oxidation and reduction, writing half equations and writing redox equations.

It is suggested that practical activities in Experiment 25 from STAWA Exploring Chemistry Stage 2, particularly part B, be completed by students before progressing to Investigating sulfides.

In part B, question 8 of Investigating sulfides asks students to write a general equation that represents hydrogen peroxide reacting with a sulfide. It may not be obvious from the equation why this reaction lowers pH. This arises because of disproportionation (simultaneous oxidation and reduction) of hydrogen peroxide, as shown by this equation:



If there is no natural pyrite rich soil readily available for parts C and D of this procedure then artificial soil can be produced by adding about 2% pyrite (by mass) to sand.

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Technical requirements

The teachers guide and procedure sheet require Adobe Reader (version 5 or later), which is a free download from www.adobe.com. The procedure sheet is also available in Microsoft Word format.

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Associated SPICE resources

Redox reactions 2: Sulfide chemistry may be used in conjunction with related SPICE resources to address the broader topic of redox.

| DESCRIPTION | LEARNING PURPOSE |
|---|------------------|
| <i>Redox reactions (overview)</i> This learning pathway shows how a number of SPICE resources can be combined to teach the topic of redox reactions. | |
| <i>Redox reactions 1: Acid soils</i> A video shows scientists studying acid sulfate soils in two different environments and raises student awareness of the broader problem. | Engage |
| <i>Redox reactions 2: Sulfide chemistry</i> Students explore the chemistry of sulfides through laboratory-based activities. | Explore |
| <i>Redox reactions 3: Acid soils and redox</i> An interactive learning object explains the chemistry of redox processes that lead to the formation of acid sulfate soils. | Explain |
| <i>Redox reactions 4: Bioremediation</i> Students investigate how acid sulfate soil problems can be dealt with through a practical activity and a case study. | Elaborate |