

MIYNYDD PARYS MINERALS

The minerals were laid down underwater in Black Smokers. These are volcanic vents that spewed out very acidic hot water laden with the chemical building blocks from which minerals are formed. This hot water was rich in sulphur from the volcanic activity. Most of the minerals that were formed contain sulphur.

As the acidic hot water, laden with metals and sulphur, sank down onto the sea floor, it cooled and became pH neutral. In cool waters the chemicals arranged themselves into crystals of minerals. Over time this happened again and again until the whole of the ancient sea floor was covered with minerals.

This former sea floor is now part of the geology of north east Anglesey. It was buried beneath later rock formations. Mountain building movements uplifted the rocks and they were exposed to weathering and erosion. The minerals that originally formed on the ancient sea floor are the minerals that were mined at Mynydd Parys.

Those original Black Smoker minerals are:

FeS₂ pyrite

PbS galena – ore of lead

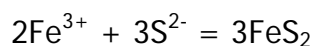
CuFeS₂ chalcopyrite – ore of copper

ZnFeS sphalerite – ore of zinc

Copper – rare in native form

SiO₂ – quartz

The chemical elements that make up these metals were loose as ions in the scalding acid water. They combined to form the minerals like this:



Gradually, over time these minerals have weathered and reacted with rainwater to form other, secondary, minerals. The chemicals that make up these other minerals are all found in those first, or primary minerals, that were formed on the ancient sea floor. Some of these secondary minerals, were first discovered by geologists on Anglesey.

Imagine if all the minerals above were split up into their chemical elements by weathering. You would have a lot of free ions, some positive ions and some negative ions. Water would then be able to carry some of them.

The positive ones are:

Fe, Pb, Cu, and Zn. And H⁺ from the water.

The negative ones are:

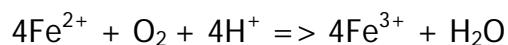
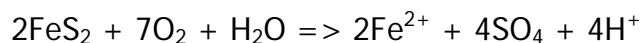
S, and OH⁻ from the water. You would also form SO₄.

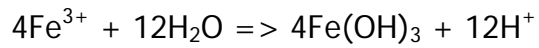
The minerals that are made after weathering and reaction with rainwater are a combination of the minerals that were already there. These are the secondary minerals that you can find at Mynydd Parys :

| | | |
|---|--|---|
| PbSO ₄ Anglesite | CaSO ₄ Gypsum | Cu ₂ (CO ₃)(OH) ₂ Malachite |
| Cu ₂ O Cuprite | CaMg(CO ₃) ₂ Dolomite | |
| Cu ₃ (CO ₃) ₂ (OH) ₂ Azurite | FeO(OH) Goethite | |

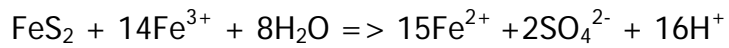
One mineral alters into another mineral: pyrite is gradually changes into marcasite, and marcasite beomes goethite.

These are the chemical equations for the breakdown of marcasite to Fe ions through weathering:





Overall:



The Fe ions released are then oxidised to form Goethite $\text{FeO}(\text{OH})$.

This leaves H_2SO_4 better known as sulphuric acid.

THIS IS HOW THE WEATHERING of PYRITE leads to the formation of ACID.

As a result of this process there formed a huge acid lake under Mynydd Parys that is about as acidic as battery acid – pH3. Recently it was drained and the possibility of an environmental disaster was averted.