

THE ORIGIN OF HYDROTHERMAL FLUIDS FROM GRANITES

This worksheet is designed to help you understand what happens to the volatiles, mostly water, as the magma crystallises. Once there is sufficient free water it is squeezed out of the granite and forms a hydrothermal fluid. This hot water will dissolve some chemicals from the granite and these will be precipitated out as mineral veins. Not all hydrothermal fluids come from the crystallisation of granite.

Imagine that you have 100 tonnes of magma and that of 4% (4 tonnes) is volatiles and 96% is silicates. The volatiles are dissolved in the silicate melt and do not crystallise out. As the silicates crystallise the volatiles are left in the remaining silicate melt. But the melt can only contain up to 10% volatiles dissolved in it; any more and the volatiles separate out as a separate phase, called free water.

- 1. Complete the table below.*
- 2. What percentage of the magma has crystallised before any free water is formed?*

<i>crystallised tonnes</i>	<i>magma remaining tonnes</i>	<i>volatiles tonnes</i>	<i>silicate melt tonnes</i>	<i>volatiles %</i>	<i>free water tonnes</i>
0	100	4	96	$4/100=4\%$	0
10	90	4	86	$4/90=4.4\%$	0
20					
30					
40					
50					
60					
70					
80					
90					
100					

Teacher's Section

The correct table should look like this.

<i>crystallised silicate tonnes</i>	<i>magma remaining tonnes</i>	<i>volatiles dissolved in magma tonnes</i>	<i>Silicate melt tonnes</i>	<i>% volatiles dissolved in magma</i>	<i>free water tonnes</i>
0	100	4	96	$4/100=4\%$	0
10	90	4	86	$4/90=4.4\%$	0
20	80	4	76	$4/80=5\%$	0
30	70	4	66	$4/70=5.7\%$	0
40	60	4	56	$4/60=6.6\%$	0
50	50	4	46	$4/50=8\%$	0
60	40	4	36	$4/40=10\%$	0
70	30	3	26	$4/40$	1
80	20	2	16	$4/40$	2
90	10	1	6	$4/40$	3
100	0	0	0	$4/40$	4