[1]Crystallizing Minerals from Aqueous Solutions

C:\a-StudioClassroom\minex07notes.wpd; July 6, 2005

This is a fairly straightforward exercise. Students dissolve various salts in water and then let the solutions evaporate. Most of the compounds produce nice crystals of reasonable sized. To improve crystal size, keep everything spotlessly clean! It may be possible to grow larger crystals by using seed crystals, perhaps suspended by thread, but we have not tried that.

As with most experiments, some things will not work out "correctly." That is part of the learning that goes along with this exercise.

Evaporation and crystal growth takes weeks, depending on temperature and humidity. So, we do this in two parts. The first day we weigh and mix the solutions. The second day, perhaps 3 weeks later, we look at the crystallization products. Binocular microscopes are helpful.

The resulting crystals will have enough shape so that students will be able to make drawings that show the ideal shape. At least, they will be able to do this for most of the compounds.

Class discussion, based on this experiment, can be very educational and at any of a number of levels. Of course, one key thing to discuss is how/why crystals grow from solutions and why they are often euhedral. You can also talk about why some minerals dissolve well, while others do not.

If students are not familiar with symmetry and symmetry operators, this can be a good introduction. If they already know the basics of symmetry, then you can have them try to figure out what systems and point groups the crystals belong to. Assuming good crystal growth, students should be able to determine crystal system but point groups can be problematic. The correct answers are:

compound	**name**	**system**	**pt group**
NaCl	halite	cubic	4/m b3 2/m
KCl	sylvite	cubic	4/m b3 2/m
$K_3Fe(CN)_6$	potassium ferricyanide	monoclinic	2/m
$Cu(CH_3COO)_2$CH_2O	cupric acetate	monoclinic	2/m
$C_{12}H_{22}O_{11}$	sucrose	monoclinic	2
$NaNO_3$	sodium nitrate	rhombohedral	b3
$KAl(SO_4)_2$C12H_2O	alum	cubic	2/m b3
KNa© $_4H_4O_6$)A4H_2O	Rochelle salt	222	222

[1]This exercise is really part of one created by Peter Heaney and presented at the 1996 Teaching Mineralogy Workshop at Smith College. The reference is: Heaney, P (1997) Crystal Growth Fast and Slow. In, Brady et al. eds. (1997) Teaching Mineralogy. Mineralogical Society of America, pp 67-78.