



ESDY 13.4.2014 "Crystals"

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## *Crystal gardens*

### ***You need:***

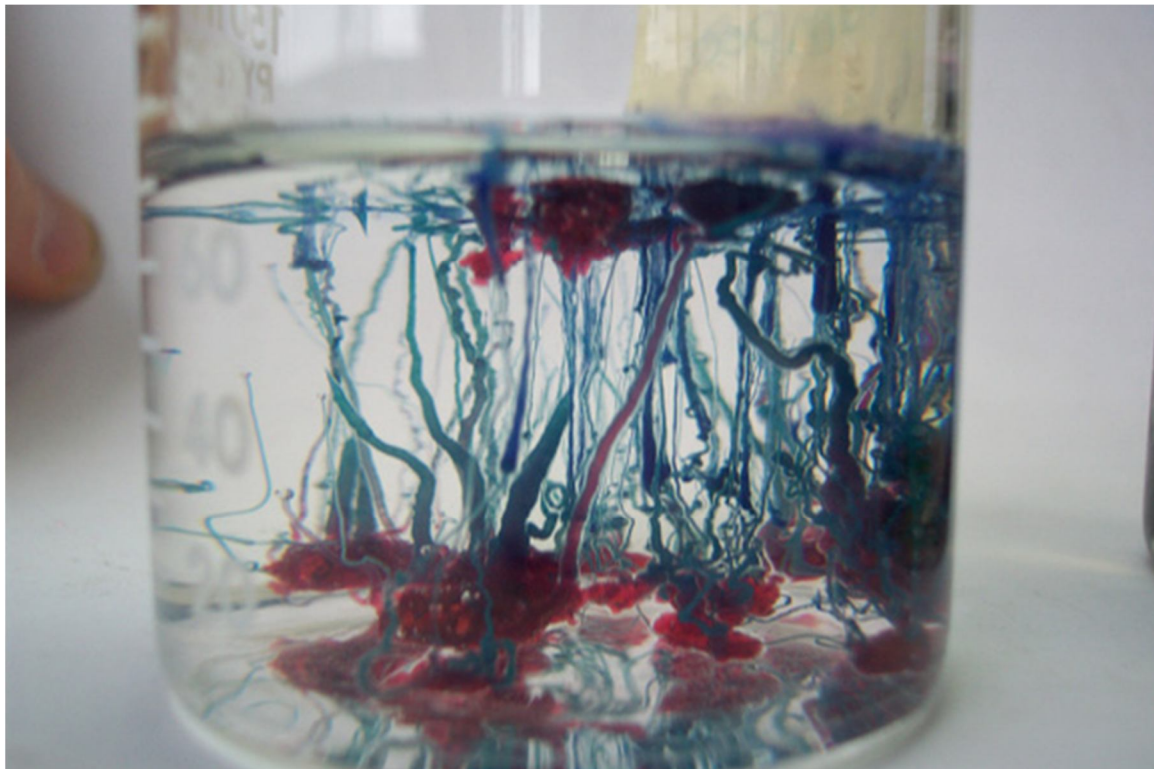
- Sodium Silicate (Salt or already solubilized), also known as liquid glass.  
15-20 g per 100 ml of water  
Or dilute the solution to reach a density of 1050-1060 g/l.
- Metal salts (important: we need a high solubility in water of the salts)

### ***Proceedings:***

Put the solution of sodium silicate in a little see-through vase.

Take small pieces or grains of metal salts and put it in the solution. Close the vase, so that air cannot get into the solution.

In a few minutes branched coloured fibers will appear into the solution.

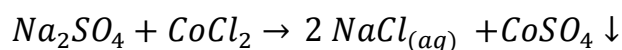


Colour will depend on the kind of metal salt used for the experiment. Here we have some examples:

- Aluminium potassium sulfate crystals – White
- Copper (II) sulfate crystals – Blue
- Chromium (III) chloride crystals – Green
- Nickel (II) sulfate crystals – Green
- Iron (II) sulfate crystals – Green
- Iron (III) chloride crystals – Orange
- Cobalt(II) chloride crystals – Pink
- Manganese Sulfate – Purple

### ***Why does it happen?***

Metal salts dissolve into the solution, giving a double replacement reaction. This reaction forms transition metal silicates, whose solubility in water is very low.



This situation forms a semi-permeable barrier which lets the water in, but not the sodium silicate; then the crystal explodes starting the reaction again. New crystals are formed until the concentration of water is not that much to carry on the mechanism.

If you want to keep the garden, close the vase very accurately, because  $CO_2$  reacts with the solution forming silicic acid which destroys the crystals.