DYEING CRYSTALS

Researchers have shown that molecules in solution – even molecules that are very different from the crystal molecules and ions – can arrange themselves on a growing crystal surface so that they make specific non covalent bonds. If these interactions are strong enough, and crystal growth is fast enough, the crystal can actually grow around and entomb the impurity. However, this only works for molecules with particular structures that match structural features of the growing crystals.

In this lab, we will attempt to grow dyed crystals of KH$_2$PO$_4$ (potassium dihydrogen phosphate; also called KDP) with an azo dye. These dyes will tend to selectively stain the pyramid faces (called {101} in crystallographic language). See below.

Crystallization is an Art. Crystal growth is effected by an array of subtle factors; concentration of the solution, amount of heat used to dissolve, rate of cooling, rate of evaporation and stillness of the crystal solution all can make a critical difference in the shape and beauty of the crystals you grow.

PROCEDURE

Incorporation of Dye into crystals of potassium dihydrogen phosphate (KDP):

Label a large beaker with your name and lab section.

Preset the heat knob of your stirring hot plate to level ‘2’ and let it warm up.

Weigh 17 grams of potassium dihydrogen phosphate (KDP), and transfer into your beaker. Add 50 mL of distilled water and a magnetic stirrer.

Cover the beaker with a watch glass and place the beaker on a hot plate. Stir the solution with the heat set at ‘2’ for 2 minutes, then turn down to ‘low’ and continue stirring until all solid has dissolved (if the KDP does not dissolve after 10 minutes you may turn up the heat a little bit).

While the solution is still warm, add 3 mL of Chicago Sky blue dye solution or 4 mL of Amaranth Red instead of your dye. Once the dye has mixed for one minute cover the solution with a watch glass and quickly and carefully place this solution in the hood or shelf in lab.