Chiral Crystallization of Ethylenediamine Sulfate

The purpose of this experiment is to demonstrate how the crystallization of achiral ethylenediamine sulfate results in the formation of chiral crystals. Large, flat, colorless crystals of ethylenediamine sulfate are obtained in an undisturbed evaporation dish within a period of approximately five to seven days. The crystals are ideal for polarimetry studies and observation using Polaroid sheets. Students become familiar with polarizing filters and how they can be used to distinguish between dextrorotatory and levorotatory crystals. The relative direction of rotation of polarized light was also determined by simply observing the change in optical rotatory dispersion of the crystals placed between two Polaroid sheets as one of the sheets was rotated clockwise or counter clockwise.

Procedure
Day 1- In a 100 mL beaker add 35mL of water and 10g of ethylenediaminesulfate.
- Heat the mixture just below boiling temperature to facilitate dissolution of the ethylenediaminesulfate.
- After the solid has completely dissolved, filter the solution into a petri dish.
- Place the dish in the hood where it will not be disturbed for 3-5 days.

Day 2- Using tweezers, remove 10 large flat crystals from the dish, and wipe them dry with Kimwipes.
- Measure the thickness of the crystals with calipers and record the values.
- Place the crystals between two Polaroid sheets, rotate the upper sheet clockwise and carefully observe the color changes. Note the order in which the colors appear. Determine whether each crystal is dextrorotatory or levorotatory.
- After the experiment is completed, the crystals should be collected for reuse.

Note: Having analyzed many dextrorotatory and levorotatory crystals with polarizing filters, it has been found that the color of dextrorotatory crystals transforms from colorless to violet to amber when the polarizing filter is rotated in the clockwise direction. Whereas the color of levorotatory crystals transforms from colorless to amber to violet when the polarizing filter is rotated in the clockwise direction.

Post-lab Questions
1. Did you obtain a racemic mixture of chiral crystals in your experiment? Would you expect to?
2. Why is there an appearance of colors only when the crystals are placed in between two Polaroid sheets?
3. Can you distinguish between dextrorotatory and levorotatory crystals of ethylenediamine sulfate by simply analyzing the crystal shape like Pasteur did?