

Chromatographic Separation of Black Felt Pen Ink

Equipment:

chromatography paper, blotting paper or white coffee filter
scissors
250-mL beaker (tall form) or tall water glass
wooden skewer
binder clip
water soluble black felt tip pens or markers (or pens or markers in another appropriate color such as green or brown)
ruler
pencil

Chemicals:

deionized water

Safety:

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Procedure:

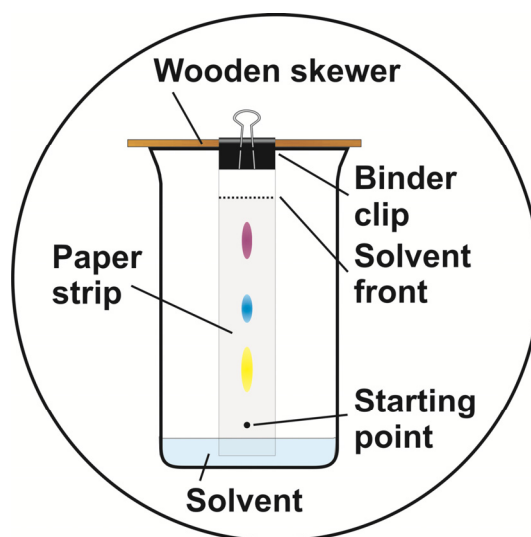
An oblong strip is cut from the filter paper so that it fits into the beaker. A straight pencil line is drawn across the width of the paper strip about 2 cm from the bottom end with the help of the ruler. The black felt tip pen is used to make a good-sized dot (like the size of a grain of rice) in the middle of this line. The beaker is filled with water to a height of about 1 to 1.5 cm. The strip of filter paper is folded over at the end opposite to the pen dot, placed over the wooden skewer and fastened with a binder clip. The end of the strip is lowered into the water but the color dot has to stay above the solvent level and the strip should not touch the bottom of the beaker.

Observation:

The solvent immediately starts moving up the paper strip, carrying the ink pigments with it. The black dot separates into variously colored components. Depending on the brand of the felt tip pen, different color patterns are created. When the water level reaches about one centimeter from the top, the skewer with the attached strip is removed from the beaker. The highest point the solvent traveled up the paper strip is marked with a pencil. Subsequently, the chromatogram should be allowed to dry.

Explanation:

Chromatography plays a major role in the separation of substances in complex mixtures. The substances to be separated, being in a mobile phase (a liquid or a gas), are passed along a stationary phase (a solid or a liquid supported on a solid). In the present case of paper chromatography, the mobile phase is water and the stationary phase is paper (or rather the water trapped as very thin layer on the cellulose fibers due to the humidity of the



air or the water present during the production of the paper). The mobile phase moves up the paper under the capillary action of pores in the paper, dissolving the sample and carrying the different components with it. The various types of dye molecules in the ink which are all more or less water soluble migrate with a different speed depending on their preference to be adsorbed onto the stationary phase versus being carried along with the mobile phase because of their solubility. In this way the components are separated from one another.

Disposal:

The paper strips can be disposed of with the household waste.