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Chemistry Learning Material Solution Mixture Separation and Magnetic Separation

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Abstract: In everyday life, a solution needs to be separated because the particles of solids that are not needed must be separated so they don't interfere with the solution or when taken or used they don't taste bad. Simple separation that can be done is separation using filter paper. Filter paper is a tool used to filter a mixture in the form of a solution through the pores of the filter paper which will leave residual solid particles on the filter paper. Meanwhile, magnetic separation is usually carried out in landfills (TPA) to separate metal, steel and iron objects from other objects besides that. Therefore, a simple experiment was carried out using simple tools, namely filter paper and magnets using simple materials, namely turmeric and paper clips as science learning. The purpose of the experiment was so that students could better understand the separation material.

Keywords: Magnetic; Mixed solutions; Separation of mixtures

Introduction

Mixture is a substance or material that is formed from the combination or mixing of two or more single substances with an uncertain ratio (Bopp et al., 2019; Drakvik et al., 2020; Martin et al., 2021). Mixtures can be combinations of elements with elements, elements with compounds, or compounds with compounds, and can be solid, gas and liquid. Physically it looks different from its constituent substances, but the mixture can be separated back into its constituent substances by the right method, without having to make chemical changes to the mixture. The properties of a mixture are the same as the properties of its constituent substances. Therefore, when separating a mixture, we must know the nature of each constituent substance so that we can determine the exact method of separation (Fardhilah, 2020).

Separation of a mixture is a process carried out to separate the constituents of a mixture (Abubakar et al., 2020). Separation of mixtures is carried out for various purposes. Some of them are to purify a substance, remove interfering deposits, separate substances so they can be reused, and so on (Chen et al., 2019; Raza et al., 2019; Sun et al., 2019).

Separation methods commonly used are separation to separate mixtures including sifting and filtering, decantation, centrifugation and magnetic separation. Sieving is a separation method using a tool called a sieve (Prume et al., 2021). Its purpose is to separate small particles from larger particles, while filtration is a filtering techniqsue that can be used to separate mixtures where the particle size of the constituent substances is different (Liu et al., 2019). Centrifugation is used to separate mixtures from hard-to-precipitate suspensions. The magnetic separation tool used is a magnet that can lift iron, metal and steel (Susilawati et al., 2023). Magnets don't work on plastic, glass, paper or cardboard. Because of this, magnets are the easiest way to separate iron, metal and steel from non-magnetic materials (Kochemirovsky et al., 2019; Susilawati et al., 2020).

The purpose of this experiment was to separate the mixture of sugar and turmeric solution with its coarse or insoluble particles using filter paper and separating the (iron) clips from the pieces of paper. Solution separation experiments are usually carried out in daily activities,

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for example separating coconut milk or coffee solutions. Meanwhile, magnetic separation is usually carried out in landfills to separate iron, metal or steel from other materials, for example plastic or paper.

Method

The tools and materials used in Solution Separation (Activity 1) are four glasses, filter paper, water, sugar, unfiltered turmeric solution, and accessories. While for magnetic separation (Activity 2) the tools and materials used are magnets, paper clips, and pieces of paper.

The steps for separating solutions (activity 1) are as follows: (a) Make a sugar solution by mixing water with sugar; (b) Label A on the glass containing sugar water; (c) Then for the turmeric solution, grate the peeled turmeric and add water until dissolved; (d) Label B on the glass containing turmeric water; (e) Prepare filter paper, cut to the size of the mouth of the glass; (f) Filter the sugar solution, then observe the particles left on the filter paper; (g) Filter the turmeric solution, then observe the particles left on the filter paper; (h) No particles are left in the sugar solution; and (i) There are particles left in the turmeric solution.

The steps for magnetic separation (activity 2) are as follows: (a) Prepare the tools to be used on the table; (b) Collect pieces of paper and paper clips; (c) Direct the magnet to the collection of pieces of paper and magnets; and (d) See which one will be lifted by the magnet.

Result and Discussion

In the first activity, namely the separation of the sugar solution and turmeric solution. The tool used for filtering is filter paper. Filter paper is used to separate liquid particles from solid particles through the pores of the filter paper. Only very small particles can pass through the pores of the filter paper, while large particles cannot pass through the pores of the filter paper.

In glass A , namely the separation of sugar water. In glass A , the separation of the sugar solution that is filtered, part of the solution will fall into the glass, while the part of the solid particles will remain on the filter paper. In glass A on the filter paper there is no precipitate or solid particles because the sugar which has been stirred evenly has completely dissolved in the water. So the sugar solution does not leave any solid particles or the filtered solution all passes through the pores of the filter paper. Then the sugar water solution is referred to as a true solution, which is a heterogeneous mixture of substances between two or more substances in which the colloid-sized particles are evenly distributed in other substances where the colloid size ranges from 1-100 nm.

Figure 1. Separation of sugar solutions

In glass B, the separation of the filtered turmeric solution, part of the solution will fall into the glass, while part of the solid particles will remain on the filter paper. This happens because the particles of liquid or solution can pass through the pores of the filter paper, but the solid particles cannot pass through the pores of the filter paper because of the size of the paper. The solid that remains on the filter paper is called the residue and the liquid that can pass through the filter paper is called the filtrate. Then the turmeric solution is called a colloid, which is a heterogeneous mixture that is formed due to the dispersion of one substance into another mixed substance.

Figure 2. Separation of coffee/turmeric solution

Figure 3. Magnetic separation

The second activity is magnetic separation. A magnet is an object that has symptoms and properties that can affect certain materials around it. These objects are iron, metal or steel. Magnet cannot attract other objects besides these objects. Each magnet has two poles, namely: north (N) and south (S). Magnetic poles are areas that are at the ends of a magnet with the greatest magnetic strength at the poles. From the magnetic experiment, only paper clips can be attracted by a magnet, while pieces of paper cannot be attracted by a magnet. Paper clips can be attracted by magnets because they are made of metal, where metal is an element that can be attracted by magnets. Meanwhile, paper is not an element that cannot be attracted or repelled by a magnet.

Conclusion

Based on the results of the experiments that have been carried out, it can be concluded that, in the separation of a mixture of sugar and turmeric water solutions, there is no precipitate or solid particles in the sugar water, which means that all the solution is filtered or passes through the pores of the filter paper. Then the sugar water is a true solution. While the turmeric water particles that can be filtered or pass through the pores of the filter paper are small particles or only the solution, while large particles or solids cannot be filtered or pass through the pores of the filter paper. So turmeric water is a colloidal solution. In magnetic separation, objects that can be attracted by magnets are paper clips because they are made of metal, while pieces of paper cannot be attracted by magnets because they are not iron, metal or steel.

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