**Dr.Manoj Kumar**

**Associate professor**

**Department of Chemistry**

**Raja Singh College,Siwan**

**Azeotropic mixture**

An azeotropic mixture is a mixture of substances that has the same concentration of vapour and fluid phases. It is basically a mixture that contains two or more liquids. A zeotropic mixture basically has constant or same boiling points and the mixtures’ vapour will also have the same composition as the liquid.

Normally, we use distillation to isolate materials as the ideal solutions with one part normally more volatile than the other. However, in an azeotropic mixture, since the vapour and fluid concentrations will be the same and this approach will prevent their separation.

Two, three and more azeotropes can be either uniform or. Azeotrope usually happens when a mixture is heated in order to produce vapour with the same liquid composition.

If the mixture deviates from [Raoult’s Law](https://byjus.com/jee/raoults-law/) then azeotropes are formed and for azeotropes bubble point and dewpoints is same. Mixtures of non-azeotropic liquids under any circumstances are referred to as zeotropic.

## Azeotrope Mixture Types

There re different types of azeotropic mixtures are possible. They are

### 1. Minimum Boiling Azeotropes or Negative Azeotrope

Azeotropic mixtures with less boiling point are called negative azeotropes in their constitutions. Water boils at hundred degrees Celsius and hydrochloric acid boil at about minus eight degrees Celsius, while azeotropes boil at around seventy-eight degrees Celsius indicating a boiling point greater than its constituents. Consider, for example, a negative azeotropic hydrochloric acid consisting of a weight concentration of approximately twenty per cent and 79 per cent of water.

**Examples:**

* Separation of water and isobutanol.
* Dehydration of ethanol.
* Separation of cyclohexane and benzene.

### 2. Maximum Boiling Azeotropes or Positive Azeotrope

Similarly, an azeotropic mixture that has a boiling point higher than its constituents is known as positive azeotropes. Consider, for example, a positive azeotrope, ethanol consisting of a weight concentration of approximately ninety-five per cent and four per cent of water. Water boils at one hundred degrees Celsius, and ethanol boils at about seventy-eight degrees Celsius, while azeotropes boil at around seventy-eight degrees Celsius, suggesting a boiling point lower than its constituents.

### 3. Heterogeneous and Homogeneous Azeotropes

When azeotropes are present in mixture constitutions and are not fully miscible, they are called heterogeneous azeotropes. On the other hand, homogeneous azeotropes are azeotropes where a mixture’s constitutions are completely miscible. Hetero Azeotropic distillation normally consists of two phases of a liquid.

### 4. Azeotropes Based on the Number of Constituents

Binary Azeotropes are two-constituted azeotropes. Ternary azeotropes are more than three azeotropic constitutions.

## Azeotropes Examples

Boiling a 95% solution of ethanol in water will produce a 95% ethanol vapour. It is not necessary to use distillation to obtain higher ethanol concentrations. Alcohol and water are miscible, making it possible to combine any quantity of ethanol with any quantity to produce a homogeneous solution that works like an azeotrope.

On the other side, chloroform and water make up a heteroazeotrope. These two liquids are separated by a mix which comes mainly from the top layer of the water, with a small amount of chloroform being dissolved and a small amount of water dissolved from the chloroform base layer. The mixture can be streamed at a lower temperature when the two layers are heated together as the boiling water or chloroform. The resultant vapour would be 97% chloroform and 3% water, irrespective of the liquid ratio. The condensation of vapours contributes to fixed layers of composition. The upper layer comprises 4.4 per cent of thickness, while the lower condensate layer contains 95.6 per cent.