

Salting Out Ethanol from Water

Description: A mixture of ethanol and water is made immiscible by the addition of potassium carbonate.

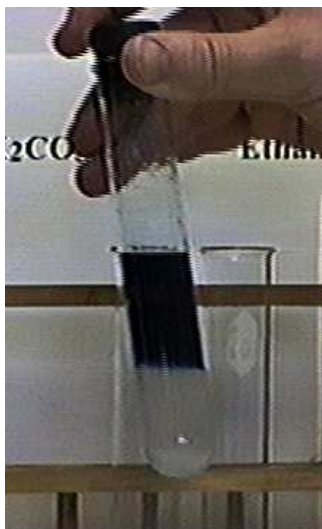
Materials:

Deionized water
Ethanol
 K_2CO_3

Test tubes
Bromothymol blue
1 M HCl

Procedure:

1. Prepare a large test tube with 10 mL ethanol, 10 mL water, a few drops of bromothymol blue indicator and one drop of 1 M HCl. The solution is homogeneous and yellow.
2. Add 3 g of K_2CO_3 to a second test tube and pour the solution from step 1 into this test tube. The test tube is sealed with a rubber stopper and mixed thoroughly with shaking. At this point the solution will become biphasic and the organic phase will be blue. Alternatively, this reaction can be scaled up in large graduated cylinders.



Discussion: Water and ethanol are miscible due to their existing intermolecular forces, the strongest of those being hydrogen bonding. As an electrolyte (in this case K_2CO_3) is added to water, the solvation of the electrolyte makes water unavailable to hydrogen bond with ethanol. The solubility of ethanol decreases as a result of the lack of hydrogen bonding interactions with water. As a result, the organic dye which was initially yellow due to the acidic solution is absorbed into the organic phase with ethanol and becomes blue.

Safety: Ethanol is flammable and should be kept away from any open flames.

Disposal: The resulting mixture should be flushed down the drain with plenty of water.

References:

Shakhashiri, B. Z. In *Chemical Demonstrations: A Handbook for Teachers of Chemistry*; The University of Wisconsin Press: 1989; Vol. 3, p 266-268.

Smith, E. T. *Chem. Educator* **1997**, 1, 1.

Video:

<http://chemeducator.org/sbibs/samples/s00010009.htm>