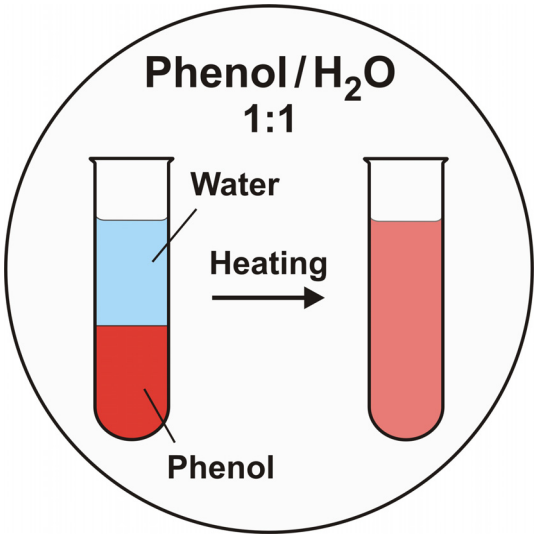
Mixing and Demixing in the System Phenol / Water



Equipment:

large test tube with rubber stooper
water bath
thermometer

Chemicals:

phenol
deionized water
methyl red powder

Safety:

phenol (C_6H_5OH):

H341-331-311-301-373-314
P280-302 + 352-301 + 330 + 331-309-310-305 + 351 + 338

Phenol is poisonous. The substance itself and its vapor is corrosive to the eyes, the skin and the respiratory tract. Phenol may cause harmful effects on the central nervous system, the heart and the kidneys. Therefore, the phenol-water mixture has to be prepared in a fume hood. It is also necessary to wear safety glasses and protective gloves.

Procedure:

Preparation: Approx. 15 g of phenol, 15 g of water and 1 mm^3 of methyl red powder are filled in the test tube. The tube is closed with the rubber stopper and gently shaken.
Procedure: At room temperature, the tube contains two liquid phases, a very phenol-rich denser phase at the bottom and a very water-rich phase at the top. For better visibility, the phenol is colored with methyl red. The water bath is heated to approx. 85 °C. The tube is put into to hot water and gently shaken.

Observation:

After a short while, the two liquids merge; the tube contains only one homogeneous phase.

Explanation:

At intermediate compositions and below the upper critical solution temperature of approx. 339 K mixtures of phenol and water separate into two liquid phases. When such a sample is heated above the upper critical solution temperature, phenol and water are completely miscible.

Disposal:

The phenol-water mixture should be disposed of as hazardous waste according to the guidelines of the corresponding institution.