

## Reduction of Volume By Mixing

### Equipment:

large test tube  
rubber stopper

### Chemicals:

deionized water  
ethanol  
food coloring

### Safety:

ethanol (C<sub>2</sub>H<sub>5</sub>OH):



H225-319

P210-240-305 + 351 + 338-403 + 233

Liquid and vapor are highly flammable. Ethanol also causes severe eye irritation. Therefore, it is necessary to wear safety glasses and protective gloves.

### Procedure:

The water is colored with a few drops of food coloring. Subsequently, the test tube is half-filled with water and then filled to the top with ethanol and closed with the rubber stopper. Finally, the test tube is inverted repeatedly.

### Observation:

The formation of a gas bubble meaning a decrease in volume of the mixture of about 4 % can be observed.

### Explanation:

The volume contraction, which can be observed when ethanol is dissolved in water, is due to hydrogen bonds between the water and ethanol molecules. This bonding draws the different molecules closer together.

### Disposal:

The solution is collected in the container for aqueous halogen-free solvent mixtures.

