

## 10.17: Miscibility

When a solid dissolves in a liquid, we very seldom find that the liquid has any tendency to dissolve in the solid. In a saturated solution of potassium chloride, for example, essentially no water dissolves in the potassium chloride crystals. With liquids the situation is usually different. If equal quantities of 1-butanol and water are shaken together, the mixture slowly separates into two layers. The bottom layer is a saturated solution of 1-butanol in water—it contains about 8% 1-butanol by weight. The top layer is not pure 1-butanol but a saturated solution of water in 1-butanol. It contains about 32% water by weight. A pair of liquids, like 1-butanol and water, which separates into two layers, but still partially mix, is said to be **partially miscible**. On a molecular level, a partially miscible mixture resembles the image below, with the two liquids (1 butanol in light blue and water in dark blue) clearly separated with slight mixing occurring.

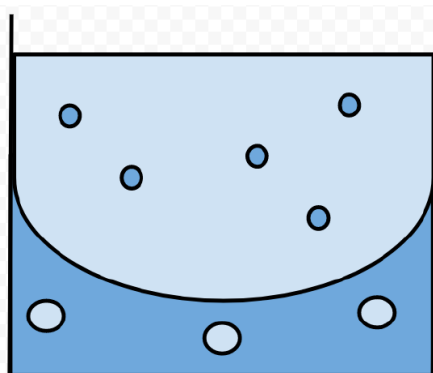


Figure 10.16.1 Partially miscible fluids separate into two layers but do mix slightly, as seen in the image above. 1-butanol is represented by the light blue liquid with water represented by the dark blue liquid.

By contrast with the solubilities of solids in liquids, a great many liquid pairs are completely miscible. That is, regardless of the proportions in which the two liquids are mixed, each will dissolve completely in the other. There will be no phase boundary as in the case of partially miscible liquids like 1-butanol and water. Ethanol and water provide a good example of two liquids which are completely miscible. If you have a source of pure ethanol, it is possible to mix a drink in any proportions you like—even up to 200 proof—without forming two separate liquid phases.

A well known example of two immiscible liquids are oil and water. Check out the below video to get a visual representation for what immiscibility looks like. Once you are done watching, take a guess, what would a mix of water and 1-butanol look like?



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