CHEM 332 - STUDY GUIDE

/Techniques/

Recrystallization - A method to purify solids

* Dissolve a solid in a solvent at elevated temperature, allowing crystals to form as the solution cools.

* This works because of the trend that solids tend to be more soluble in a hot solution than a cold one

* So if you are trying to recrystallize A from B, choose a solvent with the following properties:

  - B is highly soluble in the solvent
  - A is highly soluble in hot solvent but sparingly soluble in cold solvent

  - Therefore, as the solvent cools, A will crystallize while B remains dissolved

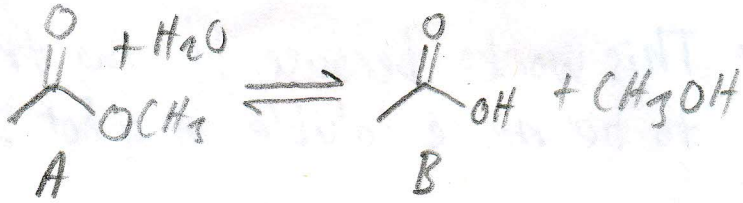
* Sometimes hot filtration is necessary before crystallization to remove colored impurities.

Reaction Equilibrium

* If a reaction is reversible, it is said to be in equilibrium. Often one desires that the reaction favor a particular product over others. There are a couple methods to make this happen

1. Use an excess of a particular starting material, usually the cheaper one.

For example:



A B

- To drive the reaction towards products, one can add water. That way, when the carbonyl carbon gets attacked, there will be a statistical bias against molecule A because there is so much H_2O available to consume.

2. Distill one of the products. As the product is distilled, it is removed from the reaction mixture. Therefore, more product is made to compensate for the lack of product.

Note: The same scenario holds true if you can get your product to precipitate out of solution. More product will be formed to compensate for the missing precipitate product.

3. If you can drive your reaction forward by removing water, a drying agent can be used.

Simple Distillation

* Apparatus used to separate pure substances from a mixture if the boiling point separation between each substance is greater than 40°C. So, the desired compound is usually the one with the lower boiling point.

Fractional Distillation

* For when Simple Distillation is insufficient, usually when a compound is to be separated from another compound with boiling points closer than 40°C.

* The column is packed with material on which several microdistillations occur, where the product becomes increasingly more pure with each one.

* Azeotropic mixtures have a boiling point minimum as a specific component mixture. Therefore, distillation will not produce a pure compound, but rather a mixture of azeotropic composition