

## Exp. 5

### Aim: Extraction of Caffeine from Tea leaves

Apparatus Required: beakers, conical flasks, distilled water, separating funnel, cold finger apparatus, glass rod, filter paper

Chemicals Required: Tea Leaves, Lead Acetate, Chloroform or dichloromethane, Sodium sulphate.

Principle: Caffeine is an example of class of compounds known as alkaloids (alkali like), which usually contains C, H, N, O and are weak bases. Many products such as tea, coffee, chocolate, soft drinks, medicines contain caffeine.

In this experiment caffeine is extracted from ~~leaves~~ tea leaves. We initially extract the caffeine in water by boiling the tea leaves with water. Additional products such as tannins, polyphenols are also extracted by this process. The difference in solubility of caffeine (less polar) as compared to other molecules is used to extract the caffeine in a organic solvent.

After gaining the crude product, sublimation is done to get pure caffeine.

### Procedure:

#### (A) Extraction:

- 1) Take 10g of tea leaves and boil it with 100 ml of distilled water in 250 ml beaker, for roughly 10 minutes (Caffeine is soluble in hot water upto good extent)
- 2) Filter the mixture carefully in hot condition to get tea extract (by removing tea leaves)



- 3) To this extract, add 10ml of 10% lead acetate and mix it thoroughly. You will see a quick precipitation. that is precipitation of many unwanted things like tannins.
- 4) Filter it using filter paper to obtain the hot aqueous extract
- 5) Transfer the extract to a 125ml separating funnel and add 20ml chloroform (organic solvent), as caffeine is more soluble in organic solvent.
- 6) Shake it well (closed separating funnel), the organic solvent creates pressure during shaking. To release the pressure, open the knob (after tilting sep. funnel) and repeat shaking for 3-4 times.
- 7) Allow two layers to separate. As chloroform is denser than water so it will form lower layer. collect the organic layer in a 250ml beaker.
- 8) Repeat the extraction with additional 20ml of organic solvent in the same funnel. (to get as much as caffeine can be extracted)
- 9) While doing this way, some amount of water may have left with this organic layer, so we add small amount of Sodium/Magnesium sulphate as dehydrating agent.
- 10) Then after filtering, to evaporate chloroform, put it on water bath.
- 11) Crude caffeine is obtained, report yield of caffeine obtained.



## B) Sublimation :

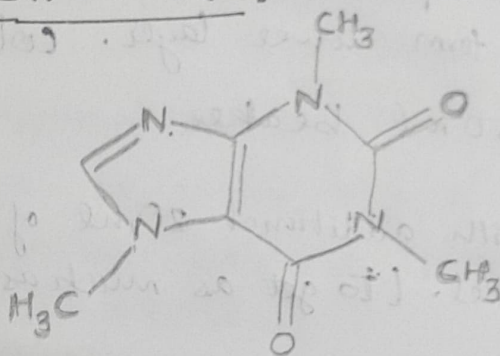
The Crude caffeine obtained is then purified by sublimation using a cold finger apparatus.

- Connect cold water inlet-outlet, vacuum pump, P
- Put caffeine in the tube.
- Heat below from oil bath.

→ Caffeine will slowly sublime and reach cold finger and get deposited there due to cooling process.

→ Collect deposited Caffeine, weigh the purified Caffeine and report percentage purity.

### Chemical structure :



Caffeine

### Observations and Calculations :

$$\text{Percentage purity} = \left( \frac{\text{weight of purified compound}}{\text{weight of crude compound}} \right) \times 100$$

Amount of crude caffeine obtained = 1.67 g

Amount of purified caffeine obtained = 1.22 g

$$\text{Percentage purity} = \frac{1.22}{1.67} \times 100 = 73.05\%$$

### Results :

- 1) Caffeine was extracted from tea leaves
- 2) Obtained compound was purified using sublimation.
- 3) percentage purity = 73.05%

### Precautions:

- 1) Do the procedure during which caffeine is in aqueous layer in hot conditions so that caffeine remain dissolved in water.
- 2) Carefully handle the hot vessels.