

Organic Chemistry 211 Laboratory
Extraction & Purification of Eugenol
(Steam Distillation)

Disposal Note:

*All the aqueous distillation solution may be poured into the sink. The solid grounds should be placed in regular trash and not in the sink.

Assemble a steam distillation apparatus (As in Simple Distillation).

Place approximately 5.0 grams of freshly ground cloves in the 100 mL round-bottom flask shown above as the distillation flask. Add 50 mL of water and 1 boiling stone. Mark the water level with a sharpie, so that you could replenish the lost (distilled) water during the experiment and prevent it from drying out. Heat the mixture until a steady distillation begins. Occasionally check the water level and add more water if necessary. In the beginning of distillation, the distillate will look murky. This is due to the presence of the essential oil in the distillate, mixed with water. As the distillation approaches completion, the distilled drops will look clearer (more transparent). After collecting about 20 mL of distillate, discontinue the heat, and transfer the distillate into a 125 mL separatory funnel. In order to assure complete transfer of the distillate, rinse the receiving flask with 5 mL of methylene chloride, and add to the contents of the separatory funnel. Extract the eugenol from water with the added methylene chloride, and collect the extracts in a 25 mL Erlenmeyer flask. Repeat the extraction with another 5 mL portion of methylene chloride, adding the extracts together. Dry the organic extracts with sodium sulfate, and filter the dried organic solution of eugenol in methylene chloride via a pipette-plug filtration, into a tared flask. Evaporate the solvent to obtain pure eugenol which will appear as an oily residue.

Measure the mass of the distilled, purified eugenol.

Obtain an IR spectrum of the purified eugenol.

For the report:

1. Calculate the amount of eugenol per gram of cloves.
2. Analyze the IR spectrum and conclude in the effectiveness of the separation and purification processes employed.
3. Predict the $^1\text{H-NMR}$ spectrum for eugenol.

Needed (per student):

- 5 grams of ground cloves-----→ 75 grams per lab
- 1 Boiling Stone-----→ 15 per lab
- 10 mL of CH_2Cl_2 -----→ ca. 150 mL per lab
- Na_2SO_4 -----