

at the end of the preparation for orthobenzoyl-benzoic acid, acts on the intermediate compound in the same way as the acid anhydrides and gives a much better yield of diphenylphthalide.

Expt. 25.—Fourteen grams of phthalyl chloride, 100 cc. benzene and 12.1 g. aluminium chloride boiled for two hours, then 10 g. phthalic anhydride added and boiling continued for two hours gave diphenylphthalide: 19.6 g. In this experiment the addition of phthalic anhydride has somewhat increased the yield of diphenylphthalide (compare Experiment 22).

Expt. 26.—Fourteen and eight-tenths grams of benzoic anhydride, 150 cc. benzene and 20.5 g. aluminium chloride boiled for two hours gave 6.3 g. of benzophenone.

Expt. 27.—Eight and three-tenths grams of phthalic anhydride, 100 cc. benzene and 15 g. aluminium chloride boiled for two hours, then 12.7 g. benzoic anhydride added and boiling continued for two hours, gave 6 g. of benzophenone, and diphenylphthalide and orthobenzoyl-benzoic acid (not weighed). In this experiment it is seen that the benzoic anhydride has the same effect as the other acid anhydrides but gives a considerable yield of benzophenone as well.

Summary.

1. Friedel and Crafts' method of preparing orthobenzoyl-benzoic acid, as used by Heller, was found to give a 97% yield and nearly 1.2 formula weights of hydrogen chloride for each formula weight of aluminium chloride used (Al_2Cl_6).

2. When less aluminium chloride is used the yield of orthobenzoyl-benzoic acid is very much reduced and diphenylphthalide is obtained, and this is found to be due to the action of the phthalic anhydride on the intermediate compound.

3. Succinic anhydride, acetic anhydride, benzoic anhydride and phthalyl chloride also gave diphenylphthalide with this intermediate compound.

4. In the preparation of benzophenone from benzoyl chloride, benzene and aluminium chloride, reducing the amount of aluminium chloride reduces the yield almost in the same proportion and the addition of phthalyl chloride gives diphenylphthalide, without materially reducing the yield of benzophenone.

5. Benzophenone may be obtained from benzoic anhydride, benzene and aluminium chloride, but the yield is not good.

6. In the case of the addition of benzoic anhydride to the preparation for orthobenzoyl-benzoic acid, benzophenone is produced in addition to diphenylphthalide.

These experiments were carried out under the direction of F. B. Allan.