

## SYNTHESIS OF SUBSTITUTED ACETOPHENONES

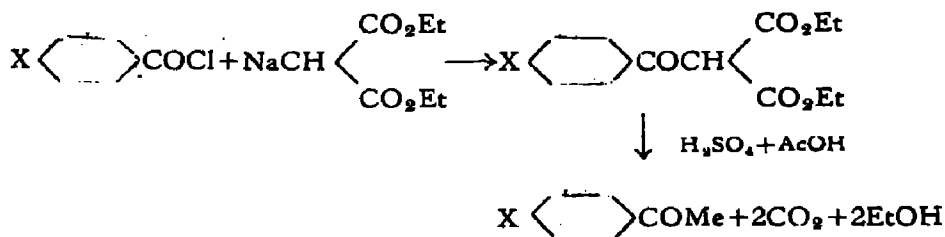
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Ten nuclear substituted acetophenones have been prepared by the hydrolysis and simultaneous decarboxylation of the corresponding benzoylmalonic esters, and characterised through their oximes.

Substituted acetophenones have so far been obtained by the following methods: (1) the hydration of the substituted phenylacetylenes (Gattermann, Ehrhardt and Maish, *Ber.*, 1890, 23, 1202) and (2) the hydrolysis of substituted benzoylmalonic esters (Thorpe and Brunkskill, *J. Amer. Chem. Soc.*, 1915, 37, 1258). Both of these methods, however, have been found unsuitable, as the first one involves a number of steps and the second one involving the use of acetoacetic ester, is unsatisfactory owing to low yields at one or more of the many stages involved in the synthesis of the  $\beta$ -keto esters, mono- or di-alkylation, and eventual ketonic hydrolysis, sometimes under severe conditions (Renfrow, *J. Amer. Chem. Soc.*, 1944, 66, 144).

Recently Schofield and Swain (*J. Chem. Soc.*, 1948, 384) have obtained *o*-nitroacetophenone by the hydrolysis of *o*-nitrobenzoylmalonic ester. It was further observed by them that good yields of the substituted benzoylmalonic esters could be obtained only by the condensation of two moles of sodiomalonic ester with one mole of an aromatic acid chloride. Following the method of these authors we have synthesised ten substituted acetophenones from appropriate substituted malonic esters. Our observations are also in accord with these authors.

The substituted benzoylmalonic esters were subjected to hydrolysis with a solution of dilute sulphuric and acetic acids and the corresponding acetophenones isolated in the manner outlined in the experimental.



### E X P E R I M E N T A L

*Preparation of the Acid Chlorides.*—The acid chlorides were prepared by the reaction of one mole of the acid with 1.5 moles of thionyl chloride. The boiling points and the yields of the chlorides are tabulated below.

TABLE I

Sr. No.	Acid chloride.	B. P.	Yield.
1	<i>o</i> -Nitrobenzoyl	148°/9mm.	98.6%
2	<i>m</i> -Nitrobenzoyl	155°/18mm.	99.0
3	<i>p</i> -Nitrobenzoyl	150°-152°/15mm.	97.2
4	<i>o</i> -Chlorobenzoyl	110°/15mm.	95.5
5	<i>m</i> -Chlorobenzoyl	225°/760mm.	96.4
6	<i>p</i> -Chlorobenzoyl	112°/18mm.	90.0
7	<i>o</i> -Tolubenzoyl	99°/14mm.	97.0
8	<i>p</i> -Methoxybenzoyl	145°/14mm.	97.0
9	<i>p</i> -Acetaminobenzoyl	Not distilled	72.5
10	<i>p</i> -Bromobenzoyl	132°-135°/17mm.	96.0

*Preparation of the Aroylmalonic Esters.*—Freshly cut pieces of sodium (2.2 moles) were covered with dry benzene in a three-necked flask, fitted with a reflux condenser and a stirrer, and a solution of freshly distilled malonic ester (2 moles) in 1 mole of dry benzene was added in small lots to it. After the addition, the reaction was completed by refluxing on a water-bath for an hour.

A solution of the acid chloride (1 mole) in dry benzene was gradually added with stirring during a period of 1 hour to an ice-cooled suspension of the sodiomalonic ester (2 moles) in dry benzene. A brisk reaction ensued with the separation of sodium chloride. The reaction mixture was then refluxed for 6 hours, cooled and decomposed by the addition of ice and dilute sulphuric acid. The benzene layer was separated, washed with dilute sulphuric acid, then with water, and dried over anhydrous sodium sulphate. On removal of the solvent, the crude sodiomalonic ester was obtained.

*Acidolysis of the Aroylmalonic Esters.*—The crude aroylmalonic ester was refluxed on a sand-bath for 4 hours with a mixture of 0.6 mole of acetic acid, 0.08 mole of concentrated sulphuric acid and 1.45 moles water. The reaction mixture was cooled by adding ice, made alkaline with a 20% caustic soda solution and extracted with ether. The residue was fractionally distilled under reduced pressure.

The following substituted acetophenones have been prepared by the procedure given above and characterised through their oximes.

TABLE II

Sr. No.	Substituted acetophenones.	B. P. or m. p.	Yield.	Melting point of oxime Found. Lit.	
1	<i>o</i> -Nitro	B. p. 140°-145°/10mm.	76.0%	115-17°	115°
2	<i>m</i> -Nitro	M. p. 79-80°	62.1	130-32°	131°
3	<i>μ</i> -Nitro	M. p. 80-81°	36.3	170-73°	172°
4	<i>o</i> -Chloro	B. p. 108°-112°/10mm.	96.0	102-04°	103°
5	<i>m</i> -Chloro	B. p. 125°-130°/10mm.	80.0	88-90°	88°
6	<i>p</i> -Chloro	B. p. 115°/10mm.	75.0	95°	95°
7	<i>o</i> -Methyl	B. p. 90°-94°/10mm.	74.0	53°	61°
8	<i>p</i> -Methoxy	B. p. 138°-139°/10mm.	91.2	87-88°	87°
9	<i>p</i> -Amino	M. p. 107°	11.1	147-48°	148°
10	<i>p</i> -Bromo	M. p. 54°	80.0	127-29°	128°

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