LXXIV.—*Introduction of the Chloroethyl Group into Phenols, Alcohols, and Amino-compounds.*

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It is well known that the ethyl ester of toluene-*p*-sulphonic acid may be employed for the ethylation of phenols; thus phenetole is readily obtained when phenol is treated with this ester in the presence of sodium carbonate. During the course of some investigations which are in progress, it became necessary to employ phenyl β -chloroethyl ethers, of which the simplest type is $\text{C}_6\text{H}_5\cdot\text{O}\cdot\text{CH}_2\cdot\text{CH}_2\text{Cl}$, and although substances of this type have, in a few instances, already been prepared from phenols by the action of ethylene dichloride in the presence of sodium hydroxide (Wohl and Berthold, *Ber.*, 1910, **43**, 2175), the process is troublesome and the yields are usually not more than 50 per cent. of those theoretically possible. It occurred to us that chloroethyl ethers of this kind might be made by acting on phenols in the presence of alkali with β -chloroethyl toluene-*p*-sulphonate, $\text{CH}_3\cdot\text{C}_6\text{H}_4\cdot\text{SO}_2\cdot\text{O}\cdot\text{CH}_2\cdot\text{CH}_2\text{Cl}$. This substance has not been described, but we find that it is readily obtained in a yield of upwards of 90 per cent. by heating toluene-*p*-sulphonyl chloride with ethylene chlorohydrin and is a viscid syrup which distils at $210^\circ/21$ mm. without decomposition. This β -chloroethyl ester reacts readily with phenol in the presence of sodium hydroxide, yielding phenyl β -chloroethyl ether together with some diphenyl ethylene ether, $\text{C}_6\text{H}_5\cdot\text{O}\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{O}\cdot\text{C}_6\text{H}_5$, the chloroethyl ether being obtained in a yield of 80 per cent. of that theoretically possible. *o*-Tolyl β -chloroethyl ether and *p*-nitro-*o*-tolyl β -chloroethyl ether were obtained from *o*-cresol and *p*-nitro-*o*-cresol in a similar manner. Experiment seems to indicate that when the nitro-group in phenols is *o*- or *p*- to the hydroxyl group, alkylation does not take place.

Phenyl β -chloroethyl ether reacts readily with aniline with the formation of β -phenoxyethylaniline, $\text{C}_6\text{H}_5\cdot\text{NH}\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{O}\cdot\text{C}_6\text{H}_5$; the corresponding β -phenoxydiethylaniline from ethylaniline yields a characteristic *p*-nitroso-derivative, $\text{NO}\cdot\text{C}_6\text{H}_4\cdot\text{NEt}\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{O}\cdot\text{C}_6\text{H}_5$. *o*-Acetylaminophenyl β -chloroethyl ether, $\text{NHAc}\cdot\text{C}_6\text{H}_4\cdot\text{O}\cdot\text{CH}_2\cdot\text{CH}_2\text{Cl}$, is produced when *o*-acetylaminophenol is treated with the β -chloroethyl ester of toluene-*p*-sulphonic acid in the presence of sodium hydroxide.

Many other benzenoid derivatives of a similar kind have been prepared and investigated, and the ease with which they are formed suggests that β -chloroethyl toluene-*p*-sulphonate and esters of

analogous constitution may prove to be valuable reagents in synthetical work.

Derivatives of β -Naphthol.—In the case of the naphthols, the conversion into the β -chloroethyl ethers by the interaction with β -chloroethyl toluene-*p*-sulphonate proceeds with great ease. Thus β -naphthol yields β -naphthyl β -chloroethyl ether, $C_{10}H_7 \cdot O \cdot CH_2 \cdot CH_2Cl$, together with small quantities of di- β -naphthyl ethylene ether, $C_{10}H_7 \cdot O \cdot CH_2 \cdot CH_2 \cdot O \cdot C_{10}H_7$. When treated with ammonia, the chloroethyl ether is evidently converted into a mixture of the bases $C_{10}H_7 \cdot O \cdot C_2H_4 \cdot NH_2$, $(C_{10}H_7 \cdot O \cdot C_2H_4)_2NH$, and $(C_{10}H_7 \cdot O \cdot C_2H_4)_3N$, but the secondary base (m. p. 103—104°) is, so far, the only one of these which has been isolated in a pure condition and investigated. If dimethylamine is employed in the place of ammonia, the sole substance produced is β -naphthyl β -dimethylaminoethyl ether, $C_{10}H_7 \cdot O \cdot C_2H_4 \cdot NMe_2$, the hydrochloride of which has local anæsthetic action.

β -Naphthyl β -chloroethyl ether (see above) is readily nitrated in acetic acid solution, and the resulting 1-nitro-derivative is reduced by stannous chloride to 1-amino- β -naphthyl β -chloroethyl ether, $NH_2 \cdot C_{10}H_6 \cdot O \cdot CH_2 \cdot CH_2Cl$. This amino-derivative is converted into $\alpha\beta$ -naphthadihydroisooxazine,

when it is boiled in amyl-alcoholic solution with potassium carbonate and a trace of copper powder.

*Action of β -Chloroethyl Toluene-*p*-sulphonate on Benzyl Alcohol.*—After it had been demonstrated that the β -chloroethyl ester interacts so readily with phenols, we were interested to ascertain whether the introduction of the chloroethyl group into aromatic alcohols could be accomplished under similar conditions, and selected benzyl alcohol for investigation. Experiment showed that this substance reacts readily with the β -chloroethyl ester in the presence of sodium hydroxide, yielding benzyl β -chloroethyl ether, $C_6H_5 \cdot CH_2 \cdot O \cdot CH_2 \cdot CH_2Cl$. This substance interacts with diethylamine, producing β -benzyloxytriethylamine, $C_6H_5 \cdot CH_2 \cdot O \cdot CH_2 \cdot CH_2 \cdot NEt_2$, and this powerful base combines with ethyl iodide to yield β -benzyloxytetraethylammonium iodide, $C_6H_5 \cdot CH_2 \cdot O \cdot CH_2 \cdot CH_2 \cdot NEt_3I$.

*The Action of β -Chloroethyl Toluene-*p*-sulphonate on Aniline and Methylaniline.*—Aniline reacts readily with the β -chloroethyl ester in the presence of sodium carbonate, but we have been unable, so far, to isolate the initial product of the interaction, namely, β -chloroethyl-aniline, $C_6H_5 \cdot NH \cdot CH_2 \cdot CH_2Cl$, because under the conditions of experiment this substance immediately undergoes condensation with itself

and also with the other substances which are present at the moment of its formation. For this reason, the substances actually isolated were diphenylethylenediamine, $\text{C}_2\text{H}_4(\text{NH}\cdot\text{C}_6\text{H}_5)_2$, and diphenylpiperazine, $\text{C}_6\text{H}_5\cdot\text{N}(\text{CH}_2\cdot\text{CH}_2)_2\text{N}\cdot\text{C}_6\text{H}_5$.

In the case of methylaniline, the action of the β -chloroethyl ester in the presence of sodium carbonate leads mainly to the formation of dimethyldiphenylethylenediamine,

but in this case it was also found possible to isolate some β -chloroethylmethylaniline, $\text{C}_6\text{H}_5\cdot\text{NMe}\cdot\text{CH}_2\cdot\text{CH}_2\text{Cl}$, an oil which condenses with β -naphthol in the presence of alkali yielding β -naphthoxyethylmethylaniline, $\text{C}_{10}\text{H}_7\cdot\text{O}\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{NMe}\cdot\text{C}_6\text{H}_5$ (compare von Braun, *Ber.*, 1917, 50, 1637).

EXPERIMENTAL.

β -Chloroethyl Toluene-p-sulphonate, $\text{CH}_3\cdot\text{C}_6\text{H}_4\cdot\text{SO}_2\cdot\text{O}\cdot\text{CH}_2\cdot\text{CH}_2\text{Cl}$.—This substance is readily prepared by boiling toluene-*p*-sulphonyl chloride (95 grams) with ethylene chlorohydrin (100 grams) in a reflux apparatus for three hours. Copious evolution of hydrogen chloride occurs at first, but this ceases after about two and a half hours. The excess of ethylene chlorohydrin (about 60 grams) is distilled off under about 250 mm., the residual syrup shaken with a little dilute sodium hydroxide and extracted with benzene. After drying over potassium carbonate and distilling off the benzene, the substance is fractionated under reduced pressure, when it distils at $210^\circ/21$ mm.; the yield is 102 grams or 87 per cent. of that theoretically possible (Found: C = 46.5; H = 4.7; Cl = 15.1; S = 13.6. $\text{C}_9\text{H}_{11}\text{O}_3\text{ClS}$ requires C = 46.1; H = 4.8; Cl = 15.3; S = 13.7 per cent.).

β -Chloroethyl toluene-p-sulphonate has a faint and not unpleasant odour and is a colourless syrup rather less viscous than glycerol; it is heavier than, and almost insoluble in, water.

Phenyl β -Chloroethyl Ether, $\text{C}_6\text{H}_5\cdot\text{O}\cdot\text{CH}_2\cdot\text{CH}_2\text{Cl}$.—This substance has already been prepared, in a yield of 48 per cent., by heating phenol with sodium hydroxide and ethylene dichloride under pressure (Wohl and Berthold, *loc. cit.*). A much better yield is obtained under the following conditions. Phenol (38 grams), sodium hydroxide (17 grams), water (30 c.c.), and β -chloroethyl toluene-*p*-sulphonate (94 grams) are heated in a water-bath for two to three hours with continuous stirring. The whole is then made strongly alkaline with sodium hydroxide and steam-distilled, when a pleasant-smelling oil (57 grams) passes over rapidly and afterwards a small quantity (1–2 grams) of diphenyl ethylene ether, $\text{C}_6\text{H}_5\cdot\text{O}\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{O}\cdot\text{C}_6\text{H}_5$, crystallises in the condenser.

The oil was fractionated without preliminary drying, when, after a few grams had passed over, phenyl β -chloroethyl ether distilled constantly at $217\text{--}220^\circ/760\text{ mm.}$, and, after solidification, melted at 28° . The yield—48 grams—can be increased by extracting the steam distillate with ether and distilling the dried extract.

o-Tolyl β -chloroethyl ether, $\text{CH}_3\cdot\text{C}_6\text{H}_4\cdot\text{O}\cdot\text{CH}_2\cdot\text{CH}_2\text{Cl}$, prepared in a similar manner from *o*-cresol, distils at $227\text{--}229^\circ/762\text{ mm.}$, and *p*-nitro-*o*-tolyl β -chloroethyl ether, $\text{CH}_3\cdot\text{C}_6\text{H}_3(\text{NO}_2)\cdot\text{O}\cdot\text{CH}_2\cdot\text{CH}_2\text{Cl}$, obtained from *p*-nitro-*o*-cresol, separates from light petroleum in pale yellow prisms and melts at 66° (Found : $\text{N} = 6.8$. $\text{C}_9\text{H}_{10}\text{O}_3\text{NCl}$ requires $\text{N} = 6.5$ per cent.).

β -Phenoxyethylaniline, $\text{C}_6\text{H}_5\cdot\text{NH}\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{O}\cdot\text{C}_6\text{H}_5$, and *p*-Nitroso- β -phenoxydiethylaniline, $\text{NO}\cdot\text{C}_6\text{H}_4\cdot\text{NEt}\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{O}\cdot\text{C}_6\text{H}_5$.—Considerable quantities of β -phenoxyethylaniline have been prepared simply by boiling aniline (19 grams) with phenyl β -chloroethyl ether (15.6 grams) in a reflux apparatus for forty-eight hours. The reaction is accelerated by adding the equivalent quantity of sodium hydroxide, but with the disadvantage that the separation of sodium chloride is apt to cause bumping. The product is rendered strongly alkaline with sodium hydroxide, any excess of aniline and phenyl β -chloroethyl ether removed by distillation in steam, and the residue cooled, when the oil solidifies; the dry solid melts directly at $43\text{--}45^\circ$ and weighs 16.8 grams. β -Phenoxyethylaniline separates from light petroleum in colourless plates and melts at $49\text{--}50^\circ$ (Found : $\text{N} = 6.6$. $\text{C}_{14}\text{H}_{15}\text{ON}$ requires $\text{N} = 6.6$ per cent.).

The corresponding derivative of monoethylaniline was prepared in a similar manner and, after removing unchanged material by distillation in steam, the crude base was dissolved in dilute hydrochloric acid and converted into the *p*-nitroso-derivative by the addition of sodium nitrite. *p*-Nitroso- β -phenoxydiethylaniline separates from light petroleum in brilliant green prisms and melts at 94° (Found : $\text{N} = 10.5$. $\text{C}_{16}\text{H}_{18}\text{O}_2\text{N}_2$ requires $\text{N} = 10.0$ per cent.).

o-Acetylaminophenyl β -Chloroethyl Ether,
 $\text{NHAc}\cdot\text{C}_6\text{H}_4\cdot\text{O}\cdot\text{CH}_2\cdot\text{CH}_2\text{Cl}$.

—In preparing this substance, *o*-acetylaminophenol (5 grams), sodium hydroxide (1.5 grams), water (3 c.c.), and β -chloroethyl toluene-*p*-sulphonate (7.8 grams) were mixed and heated in a water-bath with continuous stirring for six hours. On pouring the product into water, the oil solidified. The solid was collected, ground in a mortar with dilute alkali, washed, and dried, when 5.3 grams of nearly pure *o*-acetylaminophenyl β -chloroethyl ether remained. This substance separates from light petroleum in

colourless prisms and melts at $97-98^{\circ}$ (Found : N = 6.4. $C_{10}H_{12}O_2NCl$ requires N = 6.5 per cent.).

p-Acetylaminophenyl β -chloroethyl ether, prepared in a similar manner from *p*-acetylaminophenol, crystallises from benzene in colourless prisms and melts at $126-127^{\circ}$ (Found : N = 6.3 per cent.).

β -Naphthyl β -Chloroethyl Ether, $C_{10}H_7 \cdot O \cdot CH_2 \cdot CH_2Cl$.

This chloroethyl ether was produced when β -naphthol (30 grams), sodium hydroxide (8 grams), water (14 c.c.), and β -chloroethyl toluene-*p*-sulphonate (47 grams) were stirred and heated on the steam-bath for an hour. The oily product solidified on cooling, and was collected, ground with weak alkali, and dried on porous porcelain. In this condition it weighed 41 grams, melted at about 78° , and contained a small quantity of di- β -naphthyl ethylene ether, from which it was separated by extraction with light petroleum. On concentrating the solution, β -naphthyl β -chloroethyl ether separated in plates and melted at 83° (Found : Cl = 17.3. $C_{12}H_{11}OCl$ requires Cl = 17.2 per cent.).

α -Naphthyl β -chloroethyl ether, prepared in a similar manner from α -naphthol, melts at 28° and distils at $202^{\circ}/16$ mm. (Found : Cl = 16.8 per cent.).

Action of Ammonia and of Dimethylamine on β -Naphthyl β -Chloroethyl Ether.—When this chloroethyl ether is heated with concentrated aqueous ammonia in a sealed tube at 140° , a complex mixture of substances is obtained, from which, by crystallisation first from alcohol and then from light petroleum, $\beta\beta'$ -di-2-naphthoxy-diethylamine, $(C_{10}H_7 \cdot O \cdot C_2H_5)_2NH$, was separated in prisms melting at $103-104^{\circ}$ (Found : N = 3.8. $C_{24}H_{23}O_2N$ requires N = 3.9 per cent.).

In investigating the action of dimethylamine, the chloroethyl ether (3 grams) and alcoholic dimethylamine (12 c.c. of 14 per cent.) were heated in a sealed tube at $120-140^{\circ}$ for sixteen hours. The alcohol was removed by evaporation, sodium hydroxide added, the base extracted with benzene and distilled under reduced pressure, when β -naphthyl- β -dimethylaminoethyl ether, $C_{10}H_7 \cdot O \cdot C_2H_4 \cdot NMe_2$, passed over at $200^{\circ}/17$ mm. and crystallised on cooling in ice, the melting point being approximately $16-17^{\circ}$. The hydrochloride was obtained in colourless crystals by passing dry hydrogen chloride into the benzene solution of the base. It melts at 185° and has local anæsthetic action (Found : N = 5.5. $C_{14}H_{17}ON, HCl$ requires N = 5.6 per cent.).

1-Nitro- β -naphthyl β -Chloroethyl Ether, $NO_2 \cdot C_{10}H_6 \cdot O \cdot CH_2 \cdot CH_2Cl$.— β -Naphthyl β -chloroethyl ether (20 grams) is dissolved in boiling

glacial acetic acid (200 c.c.), and nitric acid (60 c.c. of 63 per cent.) then gradually added so soon as the temperature has fallen to 45°, the whole being continuously stirred during the operation. After half an hour, the product is diluted with water, the yellow precipitate collected, washed well, and dried on porous porcelain. The 1-nitro-derivative separates from acetic acid in pale yellow prisms and melts at 120° (Found: N = 5.5. $C_{12}H_{10}O_3NCl$ requires N = 5.6 per cent.).

1-Amino- β -naphthyl β -Chloroethyl Ether, $NH_2 \cdot C_{10}H_7 \cdot O \cdot CH_2 \cdot CH_2Cl$.—The above nitro-derivative (10 grams) was reduced by intimately mixing it with stannous chloride (26 grams) and heating with concentrated hydrochloric acid (80 c.c.) in a reflux apparatus for one and a half hours. The white tin double salt was collected, dissolved in hot water (2 litres), the tin removed by hydrogen sulphide, and the filtrate concentrated by distillation under reduced pressure in the presence of coal gas. The free amino-derivative (7.2 grams) was collected and recrystallised from light petroleum, from which it separated in leaflets melting at 85° (Found: N = 6.2. $C_{12}H_{12}ONCl$ requires N = 6.3 per cent.).

$\alpha\beta$ -Naphthadihydroisooxazine, $C_{10}H_6 \begin{smallmatrix} \text{NH} \cdot \text{CH}_2 \\ \diagdown \quad \diagup \\ \text{O} \end{smallmatrix}$.—This interesting substance is obtained when the amino-derivative just described (2.2 grams) is mixed with potassium carbonate (1.4 grams), amyl alcohol (10 c.c.), and a trace of copper powder and heated to boiling in a reflux apparatus for two hours. The amyl alcohol is removed by distillation in steam, the residual oil extracted with light petroleum, dried over potassium carbonate, and distilled under reduced pressure. The distillate solidifies on cooling, and the mass, after draining on porous porcelain, is purified by recrystallisation from light petroleum, from which the isooxazine separates in cubes melting at 44–45° (Found: C = 78.1; H = 5.8. $C_{12}H_{11}ON$ requires C = 77.8; H = 5.9 per cent.).

The Action of β -Chloroethyl Toluene-p-sulphonate on

(a) Aniline and (b) Methylaniline.

(a) *Action on Aniline.*—Aniline (9.3 grams), the chloroethyl ester (23.5 grams), sodium carbonate (5.4 grams), and xylene (20 c.c.) were heated on the water-bath with continuous stirring for six hours. The product was acidified, the xylene removed by distillation in steam, and unchanged chloro-ester (6 grams) recovered by extraction with benzene. The acid liquid was made alkaline, steam-distilled, and the oily bases (4 grams) extracted from the distillate with ether (A); the residue in the distillation flask solidified and weighed 6 grams (B).

The oily bases (*A*) yielded with toluene-*p*-sulphonyl chloride and sodium hydroxide, 2 grams of the anilide soluble in alkali, corresponding with 0.7 gram of aniline. The portion insoluble in alkali crystallised from acetic acid in plates, melted at 223°, and consisted of *di*(toluene-*p*-sulpho)*diphenylethylenediamine*, $C_6H_5 \cdot N(SO_2 \cdot C_6H_4Me) \cdot CH_2 \cdot CH_2 \cdot N(C_6H_4Me \cdot SO_2) \cdot C_6H_5$.

The substance (*B*) was extracted with boiling methyl alcohol, when, on allowing to cool, diphenylpiperazine (m. p. 166°) separated first and subsequently, from the mother-liquors, the hydrochloride of diphenylethylenediamine (m. p. 230°) was obtained. The portion insoluble in boiling methyl alcohol was not further examined.

(*b*) *Action on Methylaniline*.—In this experiment, methylaniline (21.5 grams), the chloroethyl ester (23.5 grams), and sodium carbonate (10.6 grams) were heated at 105° with continuous stirring for seven hours. The product was steam-distilled and the mixture of bases (*C*, 5.5 grams) extracted from the distillate with ether; the residue in the distillation flask was made acid with hydrochloric acid and a small quantity of unchanged chloro-ester extracted with benzene. On adding sodium hydroxide to the aqueous solution, *s*-dimethyldiphenylethylenediamine, $C_6H_5 \cdot NMe \cdot CH_2 \cdot CH_2 \cdot NMe \cdot C_6H_5$ (14 grams) was precipitated, and after crystallisation from methyl alcohol melted at 47°. The mixture of bases (*C*, 5.5 grams) was treated with toluene-*p*-sulphonyl chloride in the presence of alkali * and yielded a semi-solid mass which, on washing with dilute hydrochloric acid, left 4.3 grams of toluene-*p*-sulphonmethylanilide, $C_6H_5 \cdot NMe \cdot SO_2 \cdot C_6H_4Me$ (m. p. 94°), corresponding with 1.7 grams of methylaniline. The hydrochloric acid washings were made alkaline with sodium hydroxide and extracted with ether, when β -chloroethylmethylaniline (3.8 grams), $C_6H_5 \cdot NMe \cdot CH_2 \cdot CH_2Cl$, was

* Toluene-*p*-sulphonyl chloride is a very useful reagent for characterising primary and secondary amino-compounds and for the estimation of primary, secondary, and tertiary amino-derivatives in mixtures. In the case, for example, of a mixture of aniline, methylaniline, and dimethylaniline, the bases are left with excess of the sulphonyl chloride and aqueous potassium hydroxide (12 per cent.) for several hours. The whole is acidified, filtered, and the tertiary base (dimethylaniline) recovered from the acid solution by the addition of alkali and extraction with ether. The residue is warmed on the water-bath with excess of aqueous potassium hydroxide until all unchanged sulphonyl chloride has been decomposed, during which time the derivative of the primary base (aniline) dissolves, leaving the derivative of the secondary base (methylaniline), which may be weighed and identified by recrystallisation from methyl alcohol, etc. Finally, the derivative of the primary base is precipitated from the alkaline solution by hydrochloric acid, weighed, and recrystallised from methyl alcohol. This process is only applicable to bases which react readily with toluene-*p*-sulphonyl chloride under the conditions mentioned.

obtained, boiling at $124^{\circ}/10$ mm. This base, which does not appear to have previously been described, was digested with β -naphthol and a solution of potassium hydroxide in acetone, when it yielded β -naphthoxyethylmethylaniline, $C_{10}H_7 \cdot O \cdot CH_2 \cdot CH_2 \cdot NMePh$, which crystallised from methyl alcohol in colourless plates and melted at $73-75^{\circ}$ (Found: C = 82.2; H = 6.9; N = 4.9. $C_{19}H_{19}ON$ requires C = 82.3; H = 6.9; N = 5.0 per cent.).

Action of β -Chloroethyl Toluene-p-sulphonate on Benzyl Alcohol.
Formation of Benzyl β -Chloroethyl Ether, $C_6H_5 \cdot CH_2 \cdot O \cdot CH_2 \cdot CH_2Cl$.

In the preparation of this substance, benzyl alcohol (32.5 grams), the chloroethyl ester (72 grams), sodium hydroxide (13 grams), and water (80 c.c.) were continuously stirred and heated on the water-bath for four hours. On distillation in steam, benzyl chloroethyl ether passed over as an oil possessing a pronounced odour of oranges. This was extracted with benzene, weighed 15 grams, and distilled at $95-110^{\circ}/16$ mm.

Action of Diethylamine.—In studying this interesting action, benzyl chloroethyl ether (9.5 grams), dissolved in alcohol (15 c.c.), was mixed with diethylamine (8 grams) and heated in a sealed tube at $180-190^{\circ}$ for eight hours. The product was acidified and distilled in steam, but very little oil passed over; sodium hydroxide was then added and the distillation continued, when, after extraction with benzene, a base (7 grams) was obtained which distilled at $146^{\circ}/12$ mm. (Found: C = 76.1; H = 10.3; N = 6.7. $C_{13}H_{21}ON$ requires C = 75.4; H = 10.1; N = 6.7 per cent.).

β -Benzylxytriethylamine, $C_6H_5 \cdot CH_2 \cdot O \cdot CH_2 \cdot CH_2 \cdot NEt_2$, is sparingly soluble in water and yields readily soluble salts with hydrochloric and sulphuric acids. When the base is warmed with ethyl iodide, combination takes place readily and β -benzylxytetraethylammonium iodide, $C_6H_5 \cdot CH_2 \cdot O \cdot CH_2 \cdot CH_2 \cdot NEt_3I$, separates as a white solid, which crystallises from acetone in colourless plates melting at 105° .

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