

# COMMUNICATIONS

DE LA FACULTÉ DES SCIENCES  
DE L'UNIVERSITÉ D'ANKARA

Série B: Chimie

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TOME 22

ANNÉE 1975

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**Reactions of Tellurium Tetrachloride with Triphenyl  
Derivatives of Group V Elements.**

by

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NINA ROSHANI and BARRY C. SMITH.**

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Faculté des Sciences de l'Université d'Ankara  
Ankara, Turquie

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## Reactions of Tellurium Tetrachloride with Triphenyl Derivatives of Group V Elements.

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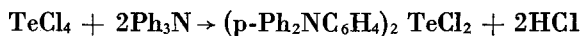
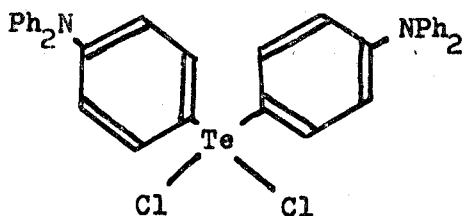
### ABSTRACT

The triphenyl derivatives of Group V elements react with tellurium tetrachloride in two different ways. Triphenylamine gives the diaryltellurium (IV) dichloride, (p-Ph<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>TeCl<sub>2</sub>.

Triphenylphosphine, triphenylarsine and triphenylstibine give the corresponding dichlorides and elemental tellurium.

### RESULTS AND DISCUSSION

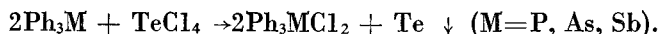
Tellurium tetrachloride reacts with dimethylaniline to give the diaryltellurium dichloride (p-Me<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>TeCl<sub>2</sub> [1]. It is shown here that the reaction between tellurium tetrachloride and triphenylamine in benzene and in the presence of triethylamine gives a similar diaryltellurium (IV) dichloride:



Tellurium tetrachloride participates in a pseudo Friedel-Crafts reaction. Electrophilic attack of  $\text{TeCl}_3^+$  at the *para* position of an aromatic ring of triphenylamine is followed by further reaction at the *para* position of an aromatic ring of a second triphenylamine molecule.

The position of substitution is established by the  $^1\text{H}$  n.m.r. spectrum of a solution of the dichloride in deuterated benzene. The spectrum consists of an AA'BB' signal  $\delta_A$  7.94;  $\delta_B$  6.90 p.p.m.;  $^3J_{AB}$  9Hz; characteristic of 1,4-disubstituted benzene, superimposed on a complex phenyl multiplet in the region  $\delta$  7.25 - 6.94 p.p.m.

The behaviour of tellurium tetrachloride with triphenylphosphine, triphenylarsine and triphenylstibine is quite different. Elemental tellurium is deposited and triphenylphosphine dichloride, triphenylarsine dichloride and triphenylstibine dichloride are obtained.



This type of reaction does not occur with triphenylamine in which the covalency of nitrogen is restricted to three. The heavier elements in Group V exhibit covalencies of three and five because of the presence of low energy d orbitals.

## EXPERIMENTAL

Tellurium tetrachloride (2.7g. 7.68 mmole) in benzene was added to a solution of triphenylamine (3.77g, 15.36) mmole) in benzene in the presence of triethylamine (2ml). After 24 hours at room temperature, triethylamine hydrochloride (0.61g) was removed by filtration. The brown solution was evaporated to dryness to give a yellow solid which was insoluble in boiling ethanol. Recrystallisation from methylene chloride - light petroleum (b.p. 60-80°C) gave yellow crystalline *bis* (p-NN-diphenylanilino) tellurium (IV) dichloride, m.p. 271-273°. Found C, 63.2; H, 4.15; N, 3.9.  $\text{C}_{36}\text{H}_{28}\text{Cl}_2\text{N}_2\text{Te}_2$  requires C, 62.9; H, 4.1; N, 4.1 %.

Tellurium tetrachloride (2.7g, 10 mmole) reacted with triphenyl phosphine (5.25g, 20 mmole) in cold benzene. Elemental tellurium (1.24g, 97 %) was removed by filtration. Hydrolysis by

96 % ethanol of the concentrated filtrate containing triphenylphosphine dichloride gave triphenylphosphine oxide (5.04 g, 90 %), m.p. 154-156°, lit. [2] m.p. 156.5°. Similar reactions with triphenylarsine and triphenylstibine gave triphenylarsine oxide hydrochloride, m.p. 164-166°, lit. [3] m.p. 171° and triphenylstibine dichloride, m.p. 140°, lit. [3] m.p. 143°.

#### ACKNOWLEDGEMENTS.

We thank the Faculty of Sciences, Ankara University, for leave of absence to Professor Dr. N. Gündüz.

#### REFERENCES.

- [1] G.T. Morgan and H. Burgess, *J. Chem. Soc.*, 1929, 1103.
- [2] G.M. Kosolapoff, "Organophosphorus Compounds," Wiley, N.Y. 1950.
- [3] G.T. Morgan, "Organic Compounds of Arsenic and Antimony," Longmans, Green and Co., London, 1918, pp. 102 and 305.

#### ÖZET

V'inci gurup elementlerinin trifenil türevleri, tellur tetraklorürle iki farklı şekilde reaksiyon verirler. Trifenilamin diaryl tellur (IV) diklorür verir.  $(p - \text{ph}_2 \text{NC}_6\text{H}_4)_2 \text{TeCl}_2$ .

Trifenil fosfin, trifenil arsin ve trifenil antıman ise yukardakine benzeyen diklorürler ile elementel telluryum verirler.

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