The Aromatic Reactivity of Tellurophen

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Summary The reactivity of tellurophen has been determined in three different electrophilic substitutions by kinetic and competitive procedures; in each case tellurophen was more reactive than thiophen and selenophen and less reactive than furan.

HEREIN, we report quantitative data on the reactivity of tellurophen, which has been recently synthesized.[1] Tellurophen, like its congeners furan, thiophen, and selenophen, reacts readily with electrophilic reagents to give products substituted at the α-position.

Since tellurophen is decomposed by strong mineral acids, good yields of substitution products can be obtained only if the reactions are carried out in alkaline, neutral, or moderately acid solutions.

We have studied the rates of formylation by phosgene and dimethylformamide,[2] of acetylation by acetic anhydride catalysed by tin(IV) chloride,[3] and of trifluoroacetylation[4] of tellurophen: the results and comparable data for the congeners of tellurophen are shown in the Table.

Formylation was carried out at 30° in chloroform and the rates were calculated from the titre of acid present in the hydrolysate. The reaction follows second-order kinetics, first order in substrate and first order in the electrophilic complex. The rate constants are displayed in the Table.

The relative rates of acetylation and trifluoroacetylation were established by a competitive procedure:[3,4] mixtures of tellurophen and selenophen (or thiophen) in dichloroethane were treated with a less than stoicheiometric amount of electrophilic reagent, and the mixtures were then analysed by g.l.c. (see Table).

TABLE

Relative rates of electrophilic substitutions and rate constants of formylation

X	10^6k/l mol^{-1} s^{-1}	Formylation (at 30°)	Acetylation (at 25°)	Trifluoroacetylation (at 75°)
O	113·4	103	11·9[a]	140[b]
S	1·10	1	1	1
Se	4·04	3·67	2·28	7·33
Te	39·6	36	7·55	46·4

[a] Ref. 3. [b] Ref. 4.

In all three reactions, tellurophen exhibited a reactivity higher than that of thiophen and selenophen but lower than that of furan. Further work is in progress.

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