CHEMISTRY LETTERS, pp. 389 - 390, 1985.

A CONVENIENT SYNTHESIS OF SYMMETRICAL DIARYL TELLURIDES USING TELLURIUM/RONGALITE AS TELLURATION SYSTEM

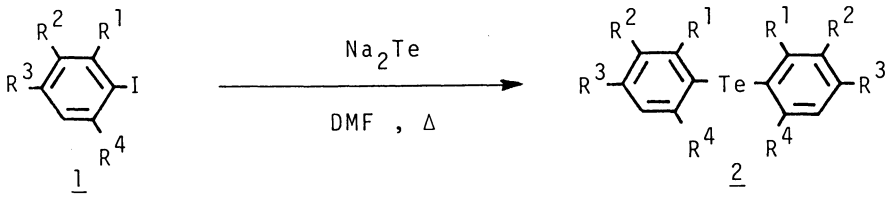
Hitomi SUZUKI* and Masahiko INOUYE

Department of Chemistry, Faculty of Science,

Ehime University, Bunkyo-cho, Matsuyama 790

Sodium telluride, prepared by reducing tellurium with rongalite in dilute aqueous sodium hydroxide, readily reacts with nonactivated aryl iodides to afford symmetrical diaryl tellurides in good yields.

On heating gently with rongalite (sodium formaldehydesulfoxylate dihydrate; $HOCH_2SO_2Na \cdot 2\ H_2O$) in dilute aqueous sodium hydroxide, tellurium is reduced to give sodium telluride as a wine-colored solution, in which vicinal dibromoalkanes are rapidly debrominated to form alkenes.[1] We now wish to report that the same reagent also reacts smoothly with nonactivated aryl iodides 1 to afford symmetrical diaryl tellurides 2 in good yields.



1 2

The reaction proceeded cleanly with nonactivated aryl iodides and no side reactions were observed. With activated ones, however, results were not satisfactory due to concurrent reductive deiodination. Attempts to accomplish similar reactions with other halides led to poor results for bromides and were unsuccessful for chlorides.

Synthesis of aromatic tellurides is of considerable current interest in connection with the development of organometals and new imaging systems. Major synthetic methods so far reported include the reaction of organometallic compounds with tellurium,[2] reduction of diaryltellurium dihalides,[2] decomposition of diaryl ditellurides,[2] reaction of aryl halides with aryltellurolate anion,[3] and photostimulated reaction of aryl halides with sodium telluride.[4] The reaction of aromatic halides with sodium telluride was only recently reported, in which the tellurating reagent employed was obtained by reacting directly sodium metal with tellurium and the yields of diaryl tellurides range between 17-35%.[4,5] Interestingly enough, sodium telluride prepared from tellurium and rongalite appears to be more efficient for introducing tellurium atom into nonactivated aromatic nucle-

Table 1. Diaryl tellurides obtained from the reaction of sodium telluride with aryl iodides[a)]

Aryl iodide 1				Diaryl telluride 2[b)]		
R^1	R^2	R^3	R^4	Mp θ_m/°C	Bp[c)] θ_m/°C(Torr)	Yield/%[d)]
H	H	H	H		150-155(1.5)	71
H	CH_3	H	H		165-168(1.5)	84
H	H	CH_3	H	62-64		81
CH_3	H	CH_3	H		167-172(0.9)	94
CH_3	H	CH_3	CH_3	124-126		77
H	H	CH_3O	H	50-52		74

a) Aromatic iodides were prepared from respective arenes according to the literature method.[6)]

b) Products were identified by mass, IR, and ^1H NMR spectra as well as by direct comparison with authentic specimens. All compounds are known.

c) Bps refer to the Kugelrohr values.

d) Yields refer to the isolated compounds and are not optimized.

us (Table 1). The present method has advantages over the existing ones in terms of better yields, simpler manipulation, inexpensiveness, and easy availability of starting materials.

A typical procedure is as follows: A mixture of powdered tellurium (1.0 mmol), rongalite (2.2 mmol), and 5N sodium hydroxide solution (1 mL) was stirred at 60 °C for 2 h under nitrogen to produce sodium telluride as a wine-colored solution, which was then evaporated to dryness under reduced pressure. To the pale yellow residue thus obtained, a solution of iodobenzene (2.0 mmol) in dry DMF (3 mL) was added and the mixture was heated at 60 °C for 10 h. The reaction was quenched by the addition of 10% ammonium sulfate solution (10 mL) and the organic phase was extracted with ether. The ethereal extract was washed with water, dried over sodium sulfate, and evaporated to give crude telluride as a yellow oil, which was purified by chromatography on silica gel using hexane as eluent. Yield, 71%. Bp 150-155 °C/1.5 Torr (Kugelrohr; lit.,[7)] 182 °C/14 Torr).

References

1) H. Suzuki and M. Inouye, Chem. Lett., submitted.
2) For a survey of these and other methods, see: K.J. Irgolic, "The Organic Chemistry of Tellurium," Gordon and Breath, New York (1974), pp.105-138; S. Uemura, Yuki Gosei Kagaku Kyokai Shi, 41, 804 (1983).
3) H. Suzuki, H. Abe, N. Ohmasa, and A. Osuka, Chem. Lett., 1981, 1115.
4) R.S. Rossi and A.B. Penenory, J. Org. Chem., 46, 4580 (1981).
5) D.J. Sandman, J.C. Stark, L.A. Acampora, and P. Gagne, Organometallics, 2, 549 (1983).
6) H. Suzuki, Org. Synth., 51, 94 (1971).
7) K. Lederer, Chem. Ber., 48, 1345 (1915).

(Received December 17, 1984)