

N-TRIFLUOROMETHYL-N-NITROSOBENZENESULFONAMIDE A NEW TRIFLUOROMETHYLATING AGENT.

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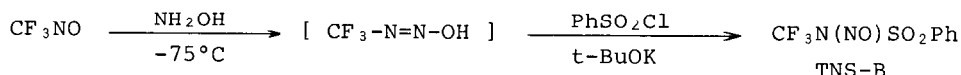
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N-Trifluoromethyl-N-nitrosobenzenesulfonamide was synthesized. It was demonstrated that it acted as a new trifluoromethylating agent.

Recently much attention has been denoted to trifluoromethyl group because of its physicochemical effects.<sup>1)</sup> Although there have been many investigations on the trifluoromethylation,<sup>2)</sup> little is known concerning the reagents for the displacement of hydrogens with trifluoromethyl groups. In most cases, trifluoromethyl iodide has been used as the reagent.<sup>2a,b,3)</sup> We now wish to report the synthesis of N-trifluoromethyl-N-nitrosobenzenesulfonamide (TNS-B) as a new trifluoromethylating agent

Based on our assumption that the compounds consisting of an eliminable heteroatom between a perfluoroalkyl group and a strong leaving group should act as perfluoroalkylating agents, we have previously synthesized (perfluoroalkyl)aryl-iodonium trifluoromethanesulfonates and demonstrated that they served as highly reactive electrophilic perfluoroalkylating agents.<sup>4)</sup> We intended to synthesize a new trifluoromethylating agent starting from trifluoronitrosomethane on the basis of the assumption.

It was reported that trifluoronitrosomethane reacted with hydroxylamine in methanol at low temperature (-75°C) to evolve nitrogen and trifluoromethyl methyl ether at elevated temperature (-55°C).<sup>5)</sup> We found that the nitrosomethane was allowed to react with hydroxylamine in DMF/THF/ether (4/5/1) at -75°C, followed by the treatment with a base in the coexistence of benzenesulfonyl chloride at -75°C to produce TNS-B<sup>6)</sup> as a stable crystalline solid in a 57% yield.



It was found that TNS-B became to be photochemically a good trifluoromethylating agent for aromatic compounds in the presence of biacetyl as a sensitizer. Irradiation of a solution of TNS-B, a substrate (1 eq), and biacetyl (1 eq) in a solvent using a Pyrex-tube under water bath-cooling with 400W high-pressure Hg lump gave the corresponding trifluoromethylated aromatic compounds in reasonable yields (Table 1). The reaction showed the behavior similar to the photochemical

Table 1. Trifluoromethylation with N-trifluoromethyl-N-nitrosobenzenesulfonamide

Run	Substrate <sup>a)</sup>	Solv.	Time(h)	Product <sup>b)</sup>	Yield(%)
1	Benzene (4 eq)	CH <sub>3</sub> CN	5	Benzotrifluoride	24 <sup>c)</sup>
2	Naphthalene	"	5	CF <sub>3</sub> -Naphthalene(α:β)	39 <sup>c)</sup> (6.3:1) <sup>e)</sup>
3	Phenol	"	5	CF <sub>3</sub> -Phenol(o:m:p)	51 <sup>c)</sup> (6.1:3.5) <sup>e)</sup>
4	p-t-Butylphenol	"	5	2-CF <sub>3</sub> -4-t-Butylphenol	59 <sup>c)</sup> , 50 <sup>d)</sup>
5	p-Dimethoxybenzene	(CH <sub>3</sub> ) <sub>2</sub> CO	5	2-CF <sub>3</sub> -1,4-Dimethoxybenzene	54 <sup>d)</sup>
6	Pyrrole (2 eq)	CH <sub>3</sub> OH	5	α-CF <sub>3</sub> -Pyrrole	51 <sup>c)</sup>
7	{S-n-C <sub>10</sub> H <sub>21</sub> )} <sub>2</sub>	(CH <sub>3</sub> ) <sub>2</sub> CO	6	CF <sub>3</sub> S-n-C <sub>10</sub> H <sub>21</sub>	55 <sup>d)</sup>
8	{SCH <sub>2</sub> COOH} <sub>2</sub>	"	14	CF <sub>3</sub> SCH <sub>2</sub> COOH	63 <sup>d)</sup>
9	{SCH <sub>2</sub> CH <sub>2</sub> COOH} <sub>2</sub>	"	3.5	CF <sub>3</sub> SCH <sub>2</sub> CH <sub>2</sub> COOH	50 <sup>d)</sup>
10	{SCH <sub>2</sub> CH <sub>2</sub> CHCOOCH <sub>3</sub> } <sub>2</sub> NHCOCF <sub>3</sub>	"	7	CF <sub>3</sub> SCH <sub>2</sub> CH <sub>2</sub> CHCOOCH <sub>3</sub> NHCOCF <sub>3</sub>	59 <sup>d)</sup>
11	{SCH <sub>2</sub> CH(OAc)CH <sub>2</sub> OAc} <sub>2</sub>	CH <sub>3</sub> CN	14	CF <sub>3</sub> SCH <sub>2</sub> CH(OAc)CH <sub>2</sub> OAc	64 <sup>d)</sup>

a) One equivalent amount of a substrate to TNS-B was used except for Run 1 and 6 b) All products exhibited spectral data (<sup>1</sup>H- and <sup>19</sup>F-NMR, IR, and Mass) in accord with the assigned structures or with the authentic samples c) <sup>19</sup>F-NMR yields d) Isolated yields e) Isomer ratios

reaction of trifluoromethyl iodide with aromatic compounds.<sup>3b,c)</sup> However the method using TNS-B is favorable because of better yields and shorter reaction time, as well as easiness in handling crystalline TNS-B compared to gaseous trifluoromethyl iodide (bp -22.5°C).

TNS-B was also found to be a good reagent for the conversion of disulfides to trifluoromethylthio compounds under the same reaction conditions (Table 1). This new reaction presented a convenient synthetic approach to biologically active trifluoromethionine<sup>7)</sup> from homocystine (Run 10). Thus, the hydrolysis of N-trifluoroacetyltrifluoromethionine methyl ester gave trifluoromethionine in a 75% yield.

#### References and Notes

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