

## One-Pot Reaction of Aldehydes, $\alpha$ -Haloketones and (Phenylsulfonyl)acetonitrile Promoted by $\text{SmI}_3$

Xue Sen FAN<sup>1,2</sup>, Yong Min ZHANG<sup>1\*</sup>

<sup>1</sup>Department of Chemistry, Zhejiang University at Xixi Campus, Hangzhou 310028

<sup>2</sup>Department of Chemistry, Henan Normal University, Xinxiang 453002

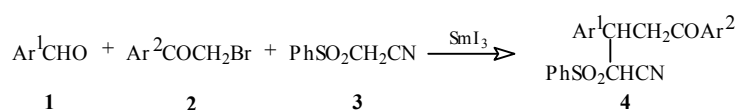
**Abstract:** One-pot reaction of aldehydes,  $\alpha$ -haloketones and (phenylsulfonyl)acetonitrile promoted by  $\text{SmI}_3$  proceeded smoothly to give 1-cyano-1-phenylsulfonyl-2-aryl-3-aryl-propane derivatives in moderate to good yields.

**Keywords:** One-pot reaction, sulfonyl group, cyano group, samarium (III) triiodide.

Recently the reports of using samarium (III) in mediating carbon-carbon bond formation reactions have rapidly increased. For example, promoted by  $\text{SmI}_3$ ,  $\alpha$ -haloketones can react with aldehydes to give  $\alpha, \beta$  – unsaturated ketones<sup>1</sup>; mediated by  $\text{SmI}_3$ ,  $\alpha$ -diketones can condense with aldehydes to form benzylidene-substituted  $\alpha$ -diketones in fair yields<sup>2</sup>. More recently we found that  $\text{SmI}_3$  can efficiently promote Michael addition of active methylene compounds to  $\alpha, \beta$  – unsaturated ketones to give poly-functionalized compounds<sup>3</sup>.

It is well known that compounds bearing sulfonyl and/or cyano group(s) are important intermediates in organic synthesis since cyano group can be easily transformed into other functionalities and sulfonyl group can be used as a good leaving group for the substitution reactions. In addition, both cyano and sulfonyl group have remarkable activation effect on the substrates and thus enable the substrates to undergo a variety of reactions. Our previous work on the reactions<sup>2,3</sup> promoted by  $\text{SmI}_3$  led us to investigate the one-pot preparation of compounds bearing both sulfonyl and cyano groups, such as 1-cyano-1-phenylsulfonyl-2-aryl-3-aryl-propane derivatives **4**, directly from one-pot reaction of aldehydes **1**,  $\alpha$ -haloketones **2** and (phenylsulfonyl)acetonitrile **3** promoted by  $\text{SmI}_3$  (as shown in **Scheme 1**). Herein we wish to report our preliminary results of this novel preparation (**Table 1**).

**Scheme 1**



\*E-mail: yminzhang@mail.hz.zj.cn

**Table 1** Preparation of 1-cyano-1-phenylsulfonyl-2-aryl-3-aryl-propanes promoted by SmI<sub>3</sub>

Entry	Ar <sup>1</sup>	Ar <sup>2</sup>	Yield (%) <sup>a</sup>
1	C <sub>6</sub> H <sub>5</sub>	C <sub>6</sub> H <sub>5</sub>	69
2	3-BrC <sub>6</sub> H <sub>4</sub>	C <sub>6</sub> H <sub>5</sub>	71
3	4-ClC <sub>6</sub> H <sub>4</sub>	C <sub>6</sub> H <sub>5</sub>	70
4	4-CH <sub>3</sub> C <sub>6</sub> H <sub>4</sub>	C <sub>6</sub> H <sub>5</sub>	66
5	C <sub>6</sub> H <sub>5</sub>	4-CH <sub>3</sub> C <sub>6</sub> H <sub>4</sub>	64
6	4-ClC <sub>6</sub> H <sub>4</sub>	4-CH <sub>3</sub> C <sub>6</sub> H <sub>4</sub>	65
7	3-BrC <sub>6</sub> H <sub>4</sub>	4-CH <sub>3</sub> C <sub>6</sub> H <sub>4</sub>	68
8	C <sub>6</sub> H <sub>5</sub>	4-BrC <sub>6</sub> H <sub>4</sub>	71
9	4-CH <sub>3</sub> C <sub>6</sub> H <sub>4</sub>	4-BrC <sub>6</sub> H <sub>4</sub>	68
10	4-ClC <sub>6</sub> H <sub>4</sub>	4-BrC <sub>6</sub> H <sub>4</sub>	75

a: Isolated yields

### Experimental

General procedure for the synthesis of compound 4: To a pale yellow suspension of SmI<sub>3</sub> (1 mmol) in THF was added **1** (1 mmol) and **2** (1 mmol) and stirred until **1** and **2** were almost consumed (monitored by TLC), then a solution of **3** (1 mmol) was added. The mixture was refluxed for 10-12 h, then water was added and the product was extracted with diethyl ether. The organic phase was collected, dried over Na<sub>2</sub>SO<sub>4</sub> and evaporated to afford the crude product. The product was purified by preparative TLC on silica gel using cyclohexane and ethyl acetate (5:1) as eluent. The products were characterized by their <sup>1</sup>H NMR, IR and Mass spectra<sup>4</sup>.

### Acknowledgment

We are grateful to the National Natural Science Foundation of China (Project No. 20072033), the NSF of Zhejiang Province, China for financial support.

### References

1. Y. P. Yu, R. H. Lin, Y. M. Zhang, *Tetrahedron Lett.*, **1993**, 34, 4547.
2. W. L. Bao, Y. M. Zhang, *Synth. Commun.*, **1996**, 26, 3025.
3. Y. M. Ma, Y. M. Zhang, *Synth. Commun.*, in press.
4. The spectra data have been sent to the Editorial Department.

Received 11 July, 2001