

## Regiospecific Synthesis of 3-Organosulfonyloxy-2-alkanones

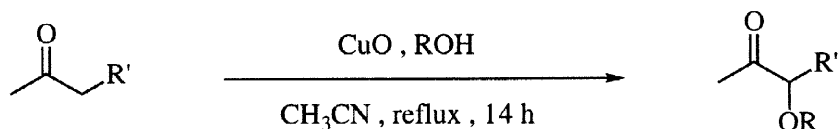
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**Abstract:** A direct regiospecific preparation method of 3-organosulfonyloxy-2-alkanones from reaction of 2-alkanones with copper(II) organosulfonates is described. © 1998 Elsevier Science Ltd. All rights reserved.

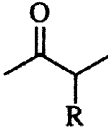
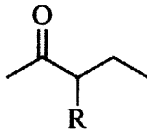
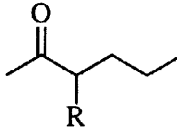
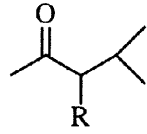
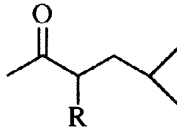
The  $\alpha$ -sulfonyloxylation of ketones is well known synthetic transformations and a number of methods have been elaborated for this purpose.<sup>1-5</sup> To date, however, direct regiospecific  $\alpha$ -sulfonyloxylation of unsymmetrical ketones has remained problematic.<sup>2-4, 5a</sup> Regiospecific  $\alpha$ -sulfonyloxylation of unsymmetrical ketones were attained by the indirect pathways using [hydroxy(organosulfonyloxy)iodo]arenes<sup>6</sup> and *p*-nitrobenzenesulfonyl peroxide (NsO<sub>2</sub>)<sup>7-8</sup>. Although the use of [hydroxy(organosulfonyloxy)iodo]arenes accomplished the direct regiospecific  $\alpha$ -sulfonyloxylation of cyclopropyl methyl ketone, it is not generally applied to the reaction of other saturated unsymmetrical ketones.<sup>2-3</sup> We report here the new and convenient method for the direct regiospecific synthesis of 3-mesyloxy-2-alkanones, 3-tosyloxy-2-alkanones, and 3-nosyloxy-2-alkanones by the reaction of 2-alkanones with corresponding copper(II) organosulfonates (prepared from copper(II) oxide and respective organosulfonic acids *in situ*) in acetonitrile at reflux for 14 h.<sup>9</sup> The results of the regiospecific introduction of various organosulfonyloxy group to the C-3 position of



R = CH<sub>3</sub>SO<sub>2</sub>- (Ms-), *p*-CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>- (Ts-), *p*-NO<sub>2</sub>C<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>- (Ns-)  
 R' = -CH<sub>3</sub>, -CH<sub>2</sub>CH<sub>3</sub>, -CH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>, -CH(CH<sub>3</sub>)<sub>2</sub>, -CH<sub>2</sub>CH(CH<sub>3</sub>)<sub>2</sub>

2-alkanones are indicated in Table 1. All of the reactions proceeded regiospecifically to provide only 3-organosulfonyloxy-2-alkanones in good to high yields without any formation of alternative C-1 sulfonyloxylation regioisomers. In control experiments, the reaction of copper(II) tosylate with acetophenone did not give  $\alpha$ -tosyloxy acetophenone, whereas the reaction with propiophenone gave the desired  $\alpha$ -tosyloxy propiophenone (75%, 14 h). These results indicated the selective reaction of thermodynamically stable enols with Cu(OR)<sub>2</sub> at the present reaction conditions. The somewhat lower yields in case of 3-mesyloxy and

**Table 1. Regiospecific synthesis of 3-organosulfonyloxy-2-alkanones.**

R	Products and Yields (%) <sup>a</sup>				
					
-OMs	71	66	65	66	70
-OTs	63	62	65	67	67
-ONs	84	78	81	80	84

<sup>a</sup> Yields of isolated pure compounds.

3-tosyloxy-2-alkanones in the Table 1, probably resulted from loss of products during the aqueous workup due to their relatively higher solubility in water compared to that of 3-nosyloxy-2-alkanones. The products obtained were readily identified by the signals of a proton attached to the C-3 atom around  $\delta = 4.4 - 5.5$  in the <sup>1</sup>H NMR spectra.

In conclusion, we have described a novel and facile method for regiospecific  $\alpha$ -sulfonyloxylation of unsymmetrical ketones.

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- A typical procedure is as follows: A mixture of copper(II) oxide (0.119 g, 1.5 mmol) and *p*-nitrobenzene sulfonic acid (0.610 g, 3.0 mmol) in acetonitrile (40 mL) was heated at reflux for 1 h until it became clean green solution. Then 2-butanone (0.072 g, 1.0 mmol) was added to the reaction mixture and stirring was continued with reflux for 13 h. The solvent was evaporated in vacuo and the residue was dissolved in 100 mL of CH<sub>2</sub>Cl<sub>2</sub>, washed with water (50 mL x 2), and dried over MgSO<sub>4</sub>. Evaporation of solvent with rotary evaporator provided pure 3-nosyloxy-2-butanone as a yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 300 MHz)  $\delta$  1.43 (d, 3H,  $J = 6.9$  Hz, CH(ONs)CH<sub>3</sub>), 2.23 (s, 3H, CH<sub>3</sub>), 4.95 (q, 1H,  $J = 7.2$  Hz, CH(ONs)CH<sub>3</sub>), 8.13 (part of ABq, 2H,  $J = 8.7$ , aromatic H), 8.41 (part of ABq, 2H,  $J = 9.0$  Hz, aromatic H).