

# SYNLETT Spotlight 396

## 2,2,6-Trimethyl-4*H*-1,3-dioxin-4-one

Compiled by Mozhdeh Seyyedhamzeh



This feature focuses on a reagent chosen by a postgraduate, highlighting the uses and preparation of the reagent in current research

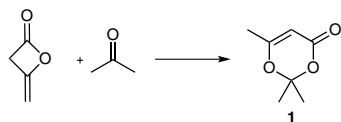
Mozhdeh Seyyedhamzeh was born in Tehran, Iran, in 1982. She received her B.Sc. in Chemistry from Tehran University in 2004 and her M.Sc. in Organic Chemistry from Shahid Beheshti University in 2007. Presently she is a Ph.D. student at the Shahid Beheshti University under the supervision of Professor Ahmad Shaabani. Her research interests focus on the design and development of multi-component reactions and the synthesis of new organic compounds, especially heterocyclic compounds based on acetoacetylating agents.

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Dedicated to my research supervisor Prof. Ahmad Shaabani

### Introduction

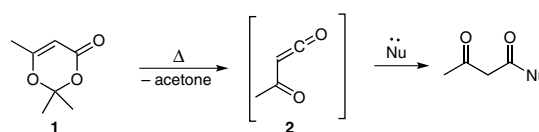
In 1952 Carroll and Bader reported that diketene and acetone can be reacted to afford 2,2,6-trimethyl-4*H*-1,3-dioxin-4-one (**1**) (Scheme 1).<sup>1</sup>



Scheme 1

Dioxinone **1** is stable at room temperature, but decomposes when pyrolyzed into acetylketene **2** and acetone. Therefore, this compound is an important building block in organic synthesis as direct precursor of  $\beta$ -dicarbonyls compounds. Thus, pyrolysis of **1** provides an acetoacety-

lation procedure in the presence of nucleophiles (Scheme 2).<sup>2</sup>

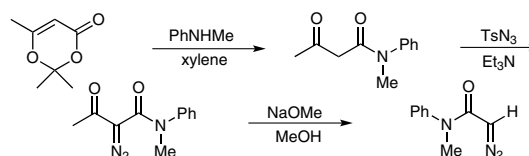


Scheme 2

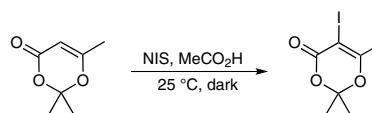
Due to the importance of  $\beta$ -dicarbonyls compounds<sup>3</sup> as excellent materials in the synthesis of heterocyclic compounds, the alternative method for the synthesis of them is the use of acetoacetylating reagents. Because of some drawbacks of using diketene as acetoacetylating reagent, 2,2,6-trimethyl-4*H*-1,3-dioxin-4-one, a 1:1 acetone diketene adduct is a convenient alternative to diketene.

### Abstracts

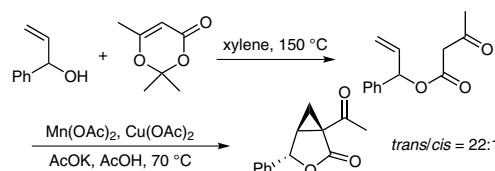
(A) 2-Diazo-*N*-methyl-*N*-phenylacetamide was prepared from *N*-methyl-3-oxo-*N*-phenylbutamide, itself synthesized from 2,2,6-trimethyl-4*H*-1,3-dioxin-4-one and *N*-methylaniline in xylene at reflux temperature, via diazo transformation with tosyl azide and subsequent hydrolysis with sodium methoxide.<sup>4</sup>



(B) The functionalization of position 5 of the 1,3-dioxin-4-ones with an electrophile leads to products with a potential use as pharmaceuticals and agrochemical intermediates. The iodination of 2,2,6-trimethyl-4*H*-1,3-dioxin-4-one with *N*-iodosuccinimide (NIS) in acetic acid furnishes 5-iodo-1,3-dioxin-4-one.<sup>5</sup>



(C) Acetoacetylation of 1-phenylprop-2-en-1-ol to provide the corresponding acetoacetate ester in excellent yield. Mn(III)-mediated oxidative cyclization of  $\beta$ -keto ester successfully provided the desired cyclopropane in good yield and excellent diastereoselectivity.<sup>6</sup>



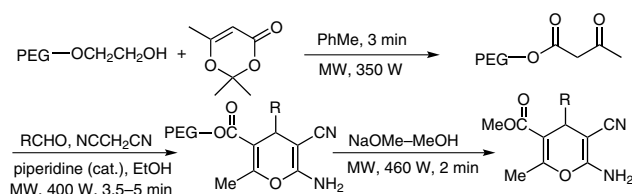
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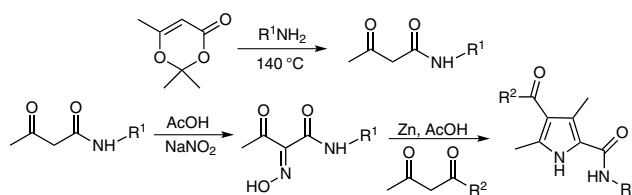
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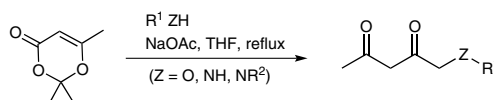
(D) 2-Amino-4-aryl-4*H*-pyran derivatives could be prepared rapidly and smoothly in good to excellent yields by the microwave-assisted liquid-phase strategy of multicomponent synthesis on polyethylene glycol.<sup>7</sup>



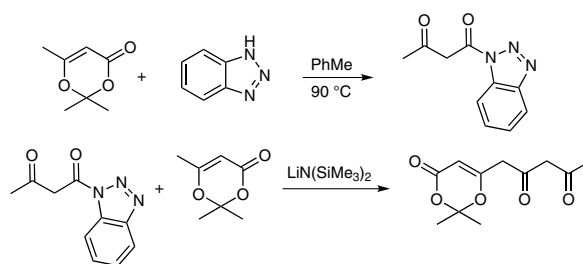
(E) Using the Knorr pyrrole synthesis, pyrrole amides were readily prepared from the oxime of the acetoacetamide derivatives that were prepared from 2,2,6-trimethyl-4*H*-1,3-dioxin-4-one.<sup>8</sup>



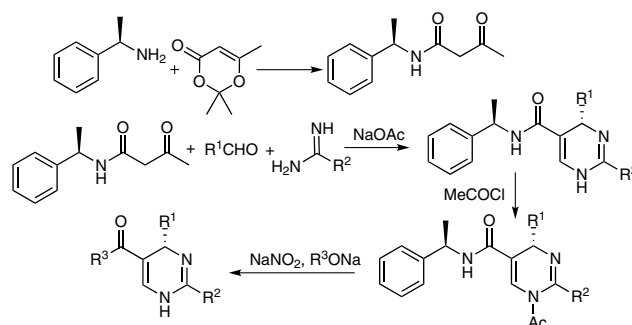
(F)  $\beta$ -Keto esters and  $\beta$ -keto amides were obtained by the reaction between 2,2,6-trimethyl-4*H*-1,3-dioxin-4-one and secondary or tertiary alcohols (including chiral ones) or primary or secondary amines.<sup>9</sup>



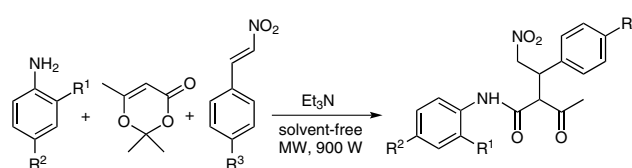
(G) Diketo-1,3-dioxinone was synthesized by thermolysis of commercially available 2,2,6-trimethyl-4*H*-1,3-dioxin-4-one, which underwent a retro-Diels-Alder reaction to form acyl ketene, which was trapped with benzotriazole to form the amide. Subsequent crossed Claisen condensation via reaction of the lithium enolate from 2,2,6-trimethyl-1,3-dioxin-4-one with amide gave diketo-1,3-dioxinone as a 5:95 mixture of keto-enol tautomers over two steps.<sup>10</sup>



(H) 2,2,6-Trimethyl-4*H*-1,3-dioxin-4-one was used in the synthesis of optical pure compounds. These compounds were used as a medicament for the treatment and prevention of type B hepatitis.<sup>11</sup>



(I) A diastereoselective microwave-assisted synthesis of 2-acetyl-*N*,3-diaryl-4-nitro-butanamides via reaction of 2,2,6-trimethyl-4*H*-1,3-dioxin-4-one, anilines, and  $\beta$ -nitrostyrenes in the presence of catalytic amounts of triethylamine was described.<sup>12</sup>



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