Synthesis And Structure Elucidation 2-Oxo-N-Propyl-2-(P-Tolyl) Ethaneselenoamide Using Modern Sophisticated Analytical Techniques

Kumar Binod Shankar [1], Jamatsing Darbarsing Rajput [2],

[1,2] Malwanchal University, Indore, M.P., India

Abstract: ***In the present investigation of 2-oxo-N-propyl-2-(p-tolyl)ethaneselenoamide involving one stage in which attacking of Selenium into carbonyl group followed by condensation reaction with amine and removal of hydroxyl group from desired Selenium compound. This Selenium compound is further confirmed by ^{1}H NMR, ^{13}C NMR, Mass, and IR.***

Keywords: *Organic ligand* containing skeletons Carbon Selenium bonds, *IR, ^{1}H NMR, ^{13}C NMR and Mass spectrum.*

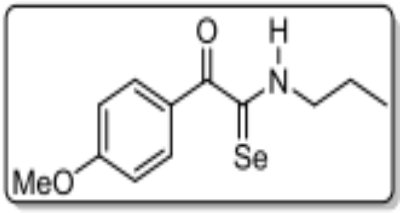
1. Introduction

The development of novel and an efficient method for the synthesis of selenoamides has been the subject of recent research interest, because of selenium containing skeletons C=Se bonds are widely spread as an important moiety in many biologically active compounds, pharmaceutical agents and as well as a versatile intermediate in organic synthesis. Various methods have been reported for the synthesis of selenoamides. However, for α-oxo-selenoamides having C=Se bond which attached to the α-carbon of the C=O group are not very common and hence it has been a challenge to many synthetic organic chemists. Drug Innovators synthesise many compounds over the process of drug development to identify imperfections in a pharmaceutical compound. The structure and pharmacological behaviour of these compounds can be studied with appropriate analytical technology.

Our literature survey has further revealed that the use of primary amines in the synthesis of the above class of compounds has not been reported. In this research paper, the first method for the synthesis, isolation, and characterization of the so far unreported α-oxo-N-alkyl selenoamides is disclosed.

All synthetic as well as analysis details are summarized below.

2. Structure of 2-oxo-N-propyl-2-(p-tolyl)ethaneselenoamide



Structure of ***2-oxo-N-propyl-2-(p-tolyl)ethaneselenoamide***

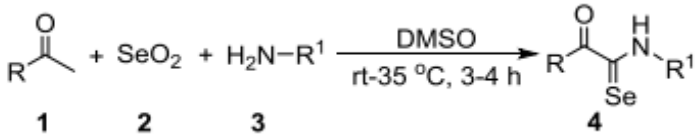
[a , α-**OXO-N-ALKYL SELENOAMIDES**]

3. Experiment

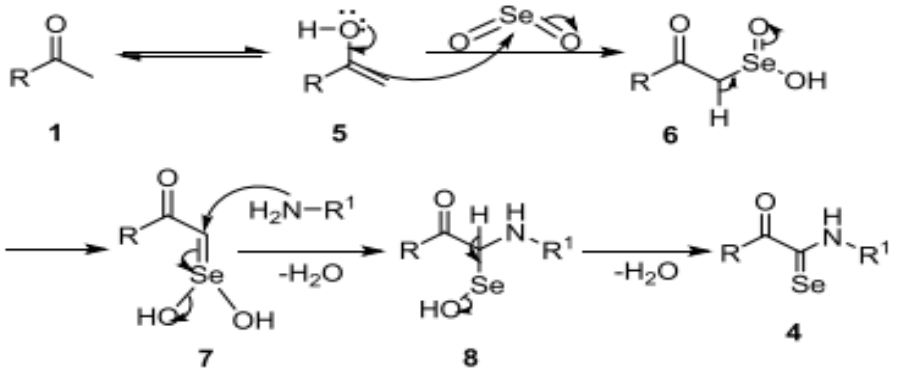
As a part of our effort towards the synthetic application of selenium dioxide and in the frame of our current research interest, herein we report the synthesis of α-oxo-N-alkyl selenoamides (4) from aryl methyl ketones (1) with primary amines (3) using selenium dioxide (2) as a selenium source at room temperature in DMSO and other suitable solvents as reaction media.

3.1 General Route of Synthesis of Selenium compound

Scheme: General Synthesis route of selenium compound

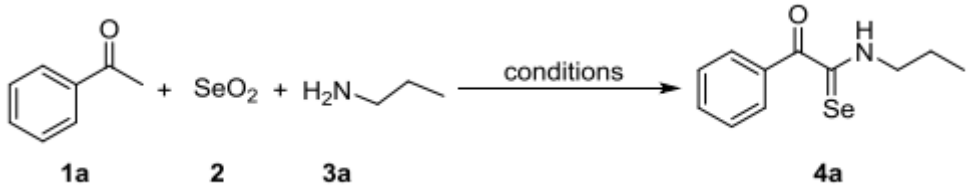


3.2 Plausible mechanism of synthesized Selenium compound



Above Route of synthesis is general scheme for synthesis of selenium compound, here R is variable. If we change R with other functionality, final product will also change. This scheme is very useful for synthesis of many different selenium derivatives.

3.3 Optimization of the reaction conditions



Our investigation started with the reaction of readily available acetophenone (1a), selenium dioxide (2) and n-propylamine (3a) as a model substrate the detailed investigations. Our initial effort of reacting acetophenone (1a), (0.116 mL, 1.0 mmol, 1 equiv) with selenium dioxide (2), (110 mg, 1.0 mmol, 1 equiv) and n-propylamine (3a), (0.82 mL, 1 mmol, 1 equiv) at room temperature for 10 minutes yielded no result. When the temperature was raised to 35 oC for 4 h, only trace amount of the product 4a was obtained (Table 5.7). Raising the temperature to 60 oC resulted in a mixture of products which could not be isolated. At this point we reasoned that using a suitable reaction medium might allow the reaction to proceed the way we wanted. Their action was performed under solvent condition and the first solvent we chose was DMSO. Thus, when the reaction was carried out in DMSO at room temperature we were gratified to observe a slight increase in the yield of the product. Changing the stoichiometry of the amine and the solvent resulted in increased product yield.

Our effort to optimize the reaction using different solvents such as H2O, EtOH, DCM were screened, but either the desired product was not formed, or the desired product was obtained in low yield. The optimized condition was achieved when the reaction was carried out using stoichiometric amount of amine with DMSO as a solvent.

Details of reaction condition tried are summarized in Table **3.3.1**

Table 3.3.1 Optimization of the reaction conditions [a]

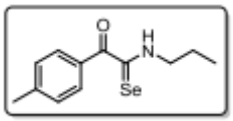
entry	substrate 3a (equiv)	solvent	t (h)	yield(%)
1	1	-	8	Trace
2	1	DMSO	8	20
3	2	DMSO	4	34
4	**3**	**DMSO**	**4**	**55**
5	4	DMSO	4	53
6	3	H_2O	4	0
7	3	EtOH	4	0
8	3	DCM	4	trace

[a]Reaction conditions: ketones (1) (1.0 mmol), SeO_2 (2) (1.0 mmol), solvent (1mL) at rt-35°C

After optimizing reaction, we have synthesized specific selenium compound (**2-Oxo-N-propyl-2-(p-tolyl)ethaneselenoamide**).

After synthesis, we have analysed the compound using various analytical techniques for its identification like ^{1}H NMR, ^{13}C NMR, Mass spectra and IR. Below is the summarized study data of **2-Oxo-N-propyl-2-(p-tolyl)ethaneselenoamide.**

3.4 Analysis data of 2-Oxo-N-propyl-2-(p-tolyl)ethaneselenoamide



Description/Appearance: Oil
Yield: 48 %
IR (KBr): 3282, 3063, 2963, 2930, 2870, 1644, 1547, 1535, 1404, 1378, 1251 cm^{-1}
^{1}H NMR (400 MHz, $CDCl_3$) : δ 9.14 (s, 1H), 7.84 (d, J = 8.0 Hz, 2H), 7.12 (d, J = 8.0 Hz, 2H), 3.68-3.63 (m, 2H), 2.32 (s, 3H), 1.83-1.74 (m, 2H), 0.99 (t, J = 7.2 Hz, 3H) ppm
^{13}C NMR (100 MHz, $CDCl_3$): δ 199.2, 189.1, 144.0, 130.0, 129.6, 127.9, 49.1, 20.8, 19.8, 10.5 ppm
HRMS (ESI) m/z: [M + Na]+ calcd for $C_{12}H_{15}NOSeNa$ 292.0217; found 292.0221.

Figure 3.4.1: IR spectrum of 2,6-dimethyl-3,5-diphenyl-2H-1,4-selenazine (29a)

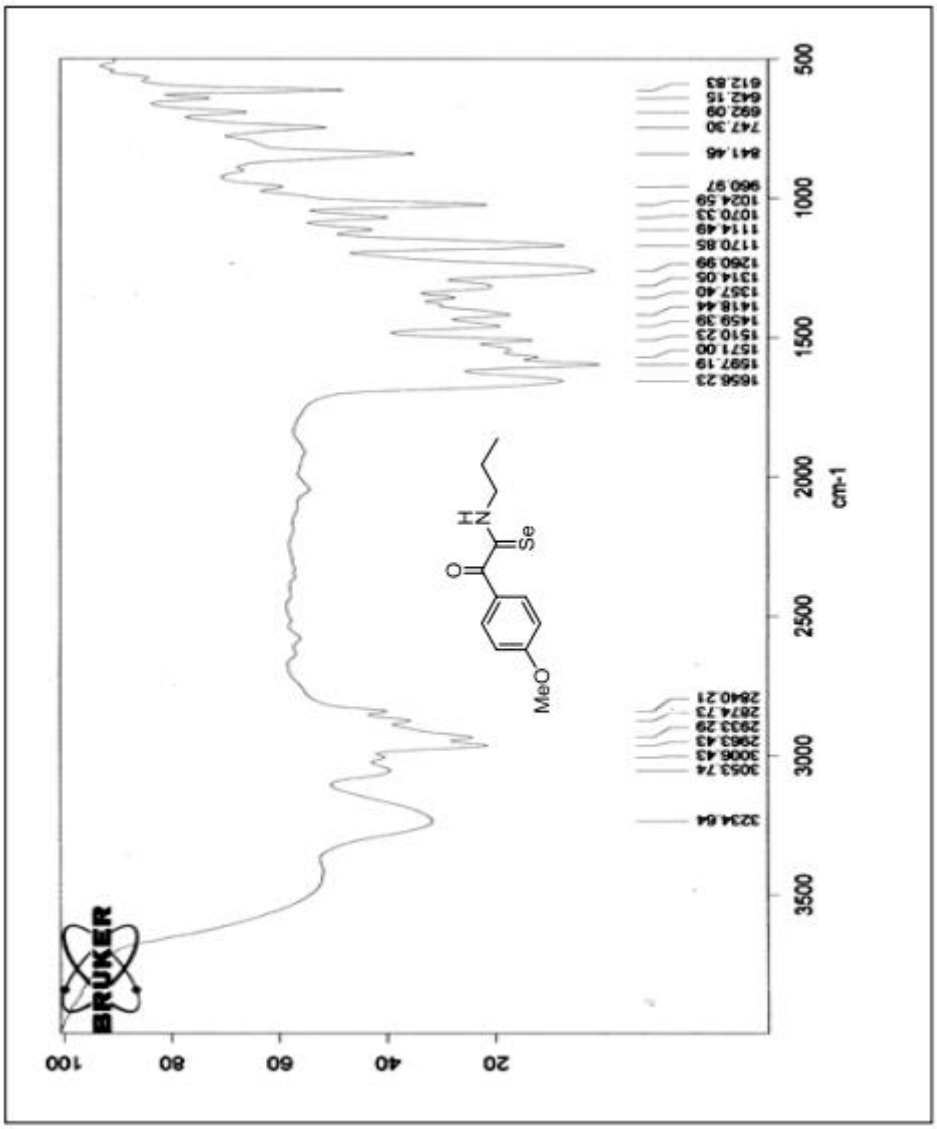


Figure 3.4.2 : 1H NMR ($CDCl_3$, 400 MHz) spectrum of 2,6-dimethyl-3,5-diphenyl-2H-1,4- selenazine (29a)

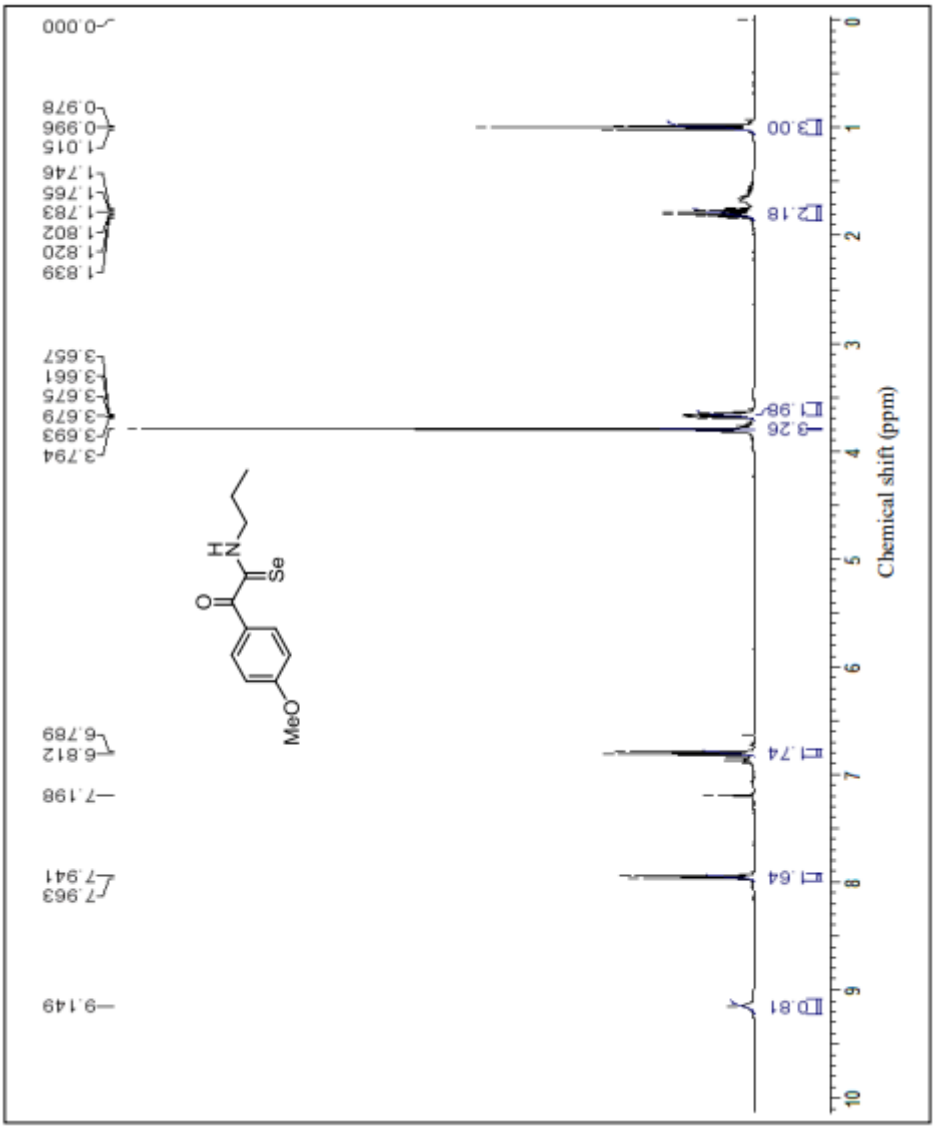


Figure 3.4.3: ^{13}C NMR (CDCl3, 100 MHz) spectrum of 2,6-dimethyl-3,5-diphenyl-2H1,4-selenazine (29a)

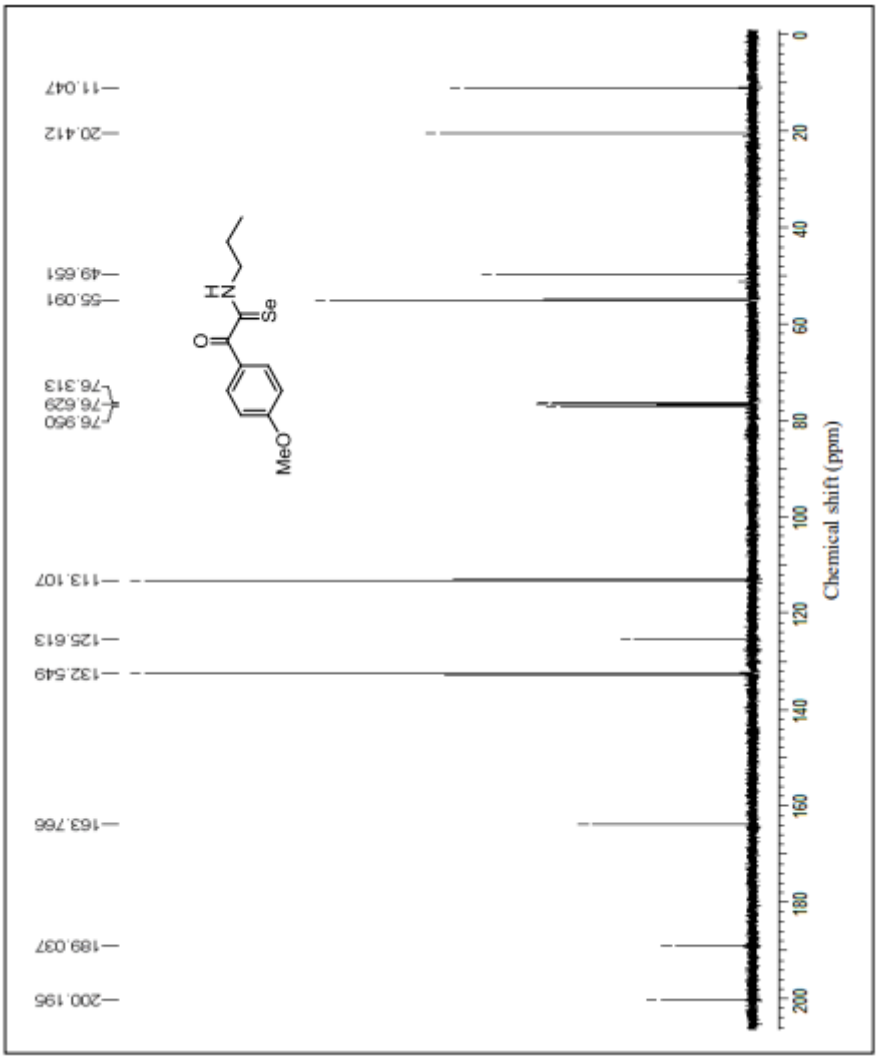
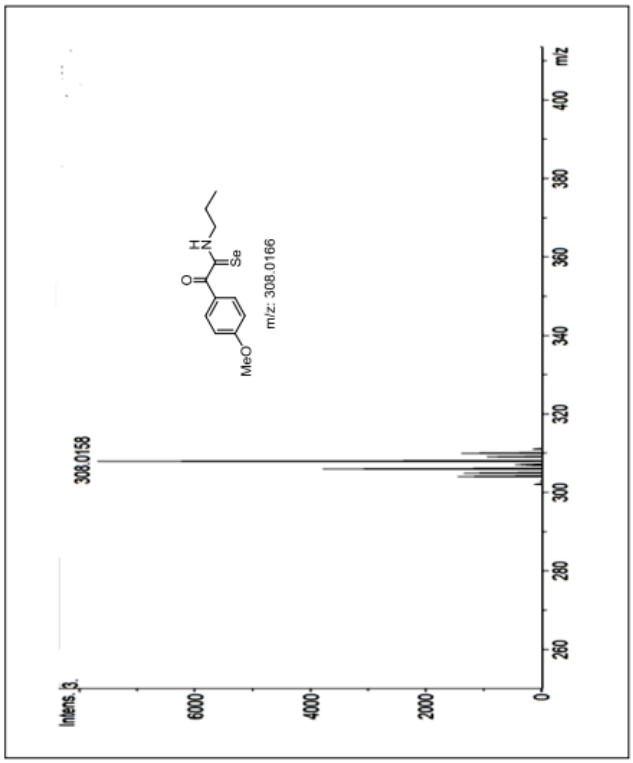


Figure 3.4.4: Mass spectrum of 2,6-dimethyl-3,5-diphenyl-2H-1,4-selenazine (29a)



4. Conclusion:

In continuation of our work on the synthetic usefulness of selenium dioxide, we shall have described a direct technique for the selenoamidation of aryl methyl ketones. The selenylating substance used in this procedure is readily accessible selenium dioxide. This approach has the advantage of not requiring a catalyst, acid, or base, and proceeding under moderate reaction conditions. To the best of our knowledge, this is the first approach for the synthesis of so yet unreported α-oxo-N-alkyl selenoamides. The current approach and the characteristics of the unreported compounds will be further researched and examined in the near future.

After synthesis of Selenium compound, it is well characterised using modern analytical techniques (^{1}H NMR, ^{13}C NMR, Mass spectra and IR).

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