

THERMAL DECOMPOSITION OF BARIUM TITANYL OXALATE MIXTURES AND THE APPLICATIONS OF THE NANOPRODUCTS

Thesis submitted to
the University of Calicut in partial fulfillment of
the requirements for the award of the degree of

DOCTOR OF PHILOSOPHY IN CHEMISTRY

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CERTIFICATE

This is to certify that the dissertation, entitled “**Thermal decomposition of barium titanyl oxalate mixtures and the applications of the nanoproducts**”, submitted to the University of Calicut, in partial fulfillment of the requirements for the award of the **Degree of Doctor of Philosophy in Chemistry** is a bonafide record of research work done by **Ms. SINDHU N. V.** during the period **2012-2018** in the Department of Chemistry at University of Calicut, under my supervision and guidance and the thesis has not formed the basis for the award of any Degree / Diploma / Associateship / Fellowship or other similar title to any candidate of any University.

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DECLARATION

I, **Sindhu N. V.**, hereby declare that the thesis, entitled **“Thermal decomposition of barium titanyl oxalate mixtures and the applications of the nanoproducs”**, submitted to the University of Calicut, is a bona fide record of research work done by me during the period **2012-2018** under the supervision and guidance of **Dr. K. Muraleedharan**, Professor, Department of Chemistry, University of Calicut and the same has not formed the basis for the award of any Degree / Diploma / Associateship / Fellowship or other similar title to any candidate of any University.

University of Calicut,
24. 09. 2018

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CONTENTS

	Page No.
Chapter 1. Introduction	1-62
1.1 General introduction	7
1.2 Review of literature	11
1.2.1 Thermal decomposition of alkaline earth metal titanyl oxalates	12
1.2.1.1 Thermal decomposition of berillium titanyl oxalates	12
1.2.1.2 Thermal decomposition of magnesium titanyl oxalate	14
1.2.1.3 Thermal decomposition of calcium titanyl oxalate	15
1.2.1.4 Thermal decomposition of strontium titanyl oxalate	17
1.2.1.5 Thermal decomposition of barium titanyl oxalate	21
1.2.2 Thermal decomposition of mixed metal oxalates	24
1.2.3 Applications of mixed metal oxides	33
1.2.3.1 Applications of Alkaline earth metal Titanates MTiO_3	
1.2.4 Computational approach	37
1.3 Aim and scope of the work	39
1.4 References	41
Chapter 2. Thermal dehydration kinetic studies of barium titanyl oxalate tetra hydrate	63-86
2.1 Introduction	63
2.1.1 Kinetic analysis	65
2.1.2 Isoconversional Methods	66
2.1.3 Calculation of activation energy by isoconversional methods	69
2.1.3.1 Bosewell Method	69
2.1.3.2 Tang Method	70

2.1.3.3 Starink ^{1.95} Method	70
2.1.3.4 Starink ^{1.92} Method	71
2.2 Experimental	71
2.2.1 Materials	71
2.2.2 Methods	71
2.3 Results and Discussion	73
2.4 Conclusion	81
2.5 References	82
Chapter 3. Thermodynamic and kinetic studies on the formation of barium titanate nano particles from barium titanyl oxalate <i>via</i> thermal decomposition	87-113
3.1 Introduction	87
3.2 Materials and methods	92
3.2.1 Materials	92
3.2.2 Preparation of BaTiO ₃ nanoparticles	92
3.2.3 Experimental methods	93
3.2.3.1 FT IR spectral analysis	93
3.2.3.2 XRD Analysis	93
3.2.3.3 Thermal analysis	93
3.2.3.4 SEM Analysis	94
3.2.3.5 TEM Analysis	94
3.3. Results and Discussion	94
3.3.1 Characterization of samples	94
3.3.1.1 XRD Analysis	94
3.3.1.2 FT-IR Analysis	95
3.3.1.3 DSC- TG Analysis of sample	96
3.3.2 Kinetic Analysis	97
3.3.2.1 Calculation of Activation energy	99
3.3.2.1.1 The Ozawa Method	99
3.3.2.1.2 The Coats & Redfern Method	100
3.3.2.1.3 SEM Analysis	100
3.3.2.1.4 TEM Analysis	111
3.4 Conclusion	112
3.5 References	113

Chapter 4. Effect of Dopant on the Multistage Thermal Decomposition Kinetics of Barium Titanyl Oxalate	118-161
4.1 Introduction	118
4.2 Experimental	121
4.2.1 Materials	121
4.2.2 Preparation of doped and undoped BTO	122
4.2.3 Methods	122
4.3 Results and Discussion	124
4.3.1 Sample Characterization	124
4.3.2 Thermal decomposition behavior	129
4.3.3 Kinetic behavior	134
4.3.4 Morphological Analysis	150
4.4 Conclusion	155
4.5 References	156
Chapter 5. Synthesis characterization and application studies of mixed metal titanates prepared <i>via</i> thermal decomposition of oxalate precursors	162-185
5.1 Introduction	162
5.2 Experimental	164
5.2.1 Materials	164
5.2.1.1 Sample preparation for conductance study	164
5.2.1.2 Sample preparation for antibacterial study	164
5.2.2 Methods	165
5.3. Results and Discussion	166
5.3.1 Conductance study	166
5.3.1.1 XRD Analysis	166
5.3.1.2 FT-IR Analysis	167
5.3.1.3 Four Probe Method	168
5.3.1.4 Electrical properties of Samples	169
5.3.1.5 UV-Visible spectroscopic Studies	171
5.3.2 Antibacterial study	174
5.3.2.1 XRD Analysis	174
5.3.2.2. SEM analysis	175
5.3.2.3 Agar-Well Diffusion Method	177

5.3.2.3.1 Antibacterial activity Test	178
5.3.2.3.2 Observation	179
5.4 Conclusion	180
5.4 References	182
Chapter 6. A comparative abinitio DFT study of electronic structure of BaTiO₃ and K doped BaTiO₃	186-204
6.1 Introduction	186
6.2 Methodology	188
6.3. Results and Discussion	190
6.3.1 Structural Properties of BaTiO ₃ and K doped BaTi O ₃	190
6.3.2 Band Structure and Density of States	191
6.3.3 The Charge Density Distribution plots	198
6.4 Conclusion	200
6.4 References	202
Chapter 7. Conclusion and future perspectives	205-207

CHAPTER 1

INTRODUCTION

**THERMAL DEHYDRATION KINETIC
STUDIES OF BARIUM TITANYL OXALATE
TETRAHYDRATE**

**THERMODYNAMIC AND KINETIC STUDIES
ON THE FORMATION OF BARIUM
TITANATE NANO PARTICLES FROM
BARIUM TITANYL OXALATE *VIA* MULTI-
STAGE THERMAL DECOMPOSITION**

**EFFECT OF DOPANT ON THE MULTISTAGE
THERMAL DECOMPOSITION KINETICS OF
BARIUM TITANYL OXALATE**

**SYNTHESIS, CHARACTERIZATION AND
APPLICATION STUDIES OF MIXED METAL
TITANATES PREPARED VIA THERMAL
DECOMPOSITION OF OXALATE
PRECURSORS**

**A COMPARATIVE ABINITIO DFT STUDY OF
ELECTRONIC STRUCTURE OF BaTiO₃ AND
K DOPED BaTiO₃**

**CONCLUSION AND FUTURE
PERSPECTIVES**

PUBLICATIONS

Peer-reviewed Research Publication

Sl . No	Journal Name, Volume,Number, Year	Title of the article	Publisher	Impact factor
1	Journal of Materials Research Bulletin 94 (2017) 231-240	Kinetic modelling of formation of K ⁺ doped BaTiO ₃ bones from barium titanyl oxalate <i>via</i> multi stage thermal decompositi on	Elsevier ISSN 0025- 5408	2.527
2	Journal of Thermal Analysis and Calorimetry doi.org/10.1007S109 73-018-7777-7	Kinetic study for the multistep thermal behavior of barium titanyl oxalate prepared <i>via</i> chemical precipitation method	Springer ISSN 1388- 6150	2.21
3	Thermochimica Acta (Under revision)	Synthesize of BaTiO ₃ nanoparticles: A multi dimensional approach.	Elsevier ISSN 0040- 6031	2.2
4	Journal of solid-state Chemistry (Submitted)	A comparative experimental and theoretical study of the electronic structure of BaTiO ₃ and K doped BaTiO ₃	Elsevier ISSN 0022- 4596	2.3

5	Journal of Thermal Analysis And Calorimetry (Submitted)	Kinetics and thermodynamics of the formation of BaTiO ₃ nanoparticles <i>via</i> multi stage thermal decomposition of oxalate precursors	Springer ISSN 1388- 6150	2.21
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CONFERENCE PAPERS

I International Conferences

- 1 Sindhu N. V., K. Muraleedharan, A comparative study of the multistep kinetic behavior of the thermal dehydration of barium titanyl oxalate, MESMAC International conference, MES Mampad College, Palakkad, Kerela, 9-11 January 2018.
- 2 Sindhu N. V., K. Muraleedharan, Thermal decomposition kinetics of BaTiO₃ and doped BaTiO₃ synthesized by thermal decomposition, MESMAC International conference, MES Mampad College, Palakkad, Kerela, 9-11 January 2018.
- 3 Sindhu N. V., K. Muraleedharan, Kinetics in solid-state synthesis of K⁺doped barium titanyl oxalate, International seminar, AMBIENTE 2017, St. Joseph's college for Women, Alappuzha, Kerala, 18-19 December 2017.
- 4 Sindhu N. V., K. Muraleedharan, Synthesis and characterization of K⁺doped BaTiO₃ via oxalate decomposition method, International Conference on Emerging frontiers in chemical sciences -2017, Farook College, Calicut, Kerala, 23-25 September 2017.
- 5 Sindhu N. V., K. Muraleedharan, Thermodynamic and kinetic study on the formation of BaTiO₃ nanoparticles prepared *via* thermal decomposition, International conference on advanced

materials science and technology-2017, Bennari Amman institute of technology. Tamil Nadu, 17-19August 2017.

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II National Conferences

- 1 Sindhu N. V., K. Muraleedharan, Kinetic behavior of the thermal decomposition of barium titanyl oxalate, National seminar, Theoretical and Experimental approaches for exploring Advanced Materials, Govt. Arts & Science College, Calicut, 13-14 December 2017.
- 2 Sindhu N. V., K. Muraleedharan, Thermal, kinetic and antimicrobial studies of BaTiO₃ nanoparticles synthesized via oxalate decomposition, 5th National conference on condensed matter physics and applications 2017, Manipal university, 22 September 2017.
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- 4 Sindhu N. V., Sarada .K, K. Muraleedharan, Catalytic effect of metal mixed oxides of lanthanum and copper on the thermal decomposition of ammonium perchlorate, Proceedings of the National Seminar on Advances in biomedical science and engineering, NIT Calicut, 17-18 October 2016.
- 5 Sindhu N. V., K. Muraleedharan, Synthesize of BaTiO₃ nanoparticles, UGC sponsored national seminar on new materials in chemistry 2015, NMC 2015, Dept. of chemistry, University of Calicut, 30-31 January 2015.

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