Synthesis, Characterization and Applications of $MnWO_4$ and $CaWO_4$ Nanoparticles

Project Report Submitted to UGC

[UGC- MRP (S)-0797/13-14/KLMG020/UGC-SWRO, dated 20- 03-2014]

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JUNE 2015

CONTENTS

ACKNOWLEDGEMENTS

I am grateful to the University Grant Commission (UGC), New Delhi for giving me this opportunity and providing funding during the course of this project. I acknowledge my thanks to the Microtron Centre, Mangalore University; Research Centre dept. of Physics, Maharaja's College, Ernakulam; SAIF Kochi; SAIF IIT Chennai and Nirmala College Muvattupuzha for providing opportunities to carry out experiments.

I express my deep and sincere gratitude to Dr. Thomas Varghese for his invaluable guidance, constant encouragement, keen interest and good wishes. I am also grateful to him for being patient while critically reviewing this UGC project report. This work would not have been possible without the guidance, help, support, critical analysis and valuable suggestions from the researchers working at NSRC, Department of Physics, Nirmala Colege, Muvattupuzh. It gives me pleasure to place on record my sincere thanks to Priyanka K P (Research Fellow) and all of my colleagues for constant encouragement during the course of present investigation.

I am thankful to Rev. Dr. Vincent Joseph (Principal) and Management of Nirmala College for the permission and timely support to undertake this investigation.

Muvattupuzha
June 2015

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Chapter 1

1. Introduction

1.1 Tungstate Nanomaterials

Tungstates can be divided into two groups with different crystal structures: scheelites ($CaWO_4$, $BaWO_4$, $SrWO_4$, and $PbWO_4$) and wolframites ($MnWO_4$, $MgWO_4$, $CdWO_4$, $ZnWO_4$, and others) [1, 2]. Over the past two decades tungstate materials have attracted much attention due to their interesting structural and photoluminescence properties [3-6]. In this project $MnWO_4$ and $CaWO_4$ nanoparticles are chosen for the investigation.

1.2 MnWO4

MnWO4 has bulk electrical conductivity, relatively low melting point, novel magnetic and photocatalytic properties [7, 8]. The optical and luminescence properties of $MnWO_4$ have received great attention as they are widely used as scintillating detectors in high-energy particle physics, rare-event searches and medical diagnosis [9]. The electrical conductivity of $MnWO_4$ is also sensitive to changes in humidity, thereby making it useful as a humidity sensor with potential applications like meteorology, medicine, food production, agriculture, industrial and domestic environment [10, 11]. There are a number of processes used to synthesize nanocrystalline $MnWO_4$, such as microwave-assisted synthesis [7,12], surfactant-assisted complexation-precipitation method [13], melt solution process [13], solvothermal route [14], aqueous salt metathesis reaction [15], sol-gel technique [10,16], ambient template synthesis [17] and solid state metathetic approach [18].