

Synthesis, Characterization and Applications of MnWO₄ and CaWO₄ Nanoparticles

Project Report Submitted to UGC

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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 MnWO_4

MnWO_4 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].