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Title of the thesis: "Optical property of rare earth based scheelite materials: Fundamental research and applications".

Synopsis

The research synopsis focuses on the comprehensive investigation of the optical properties of rare earth-based scheelite materials, encompassing both fundamental research and potential applications. Rare earth-based scheelite materials have gained prominence owing to their intriguing optical characteristics. The research entails the synthesis and thorough characterization of these materials, delving into crystal growth techniques and the determination of their crystal structure, phase purity, and morphology. Subsequently, the optical properties will be meticulously examined, encompassing absorption and emission spectra, as well as luminescence lifetimes, with special attention given to the influence of rare earth dopants on these properties. Moreover, the study will explore a spectrum of applications for these materials, ranging from their use as phosphors for white LEDs and displays, luminescent down-shifting layers to enhance solar cell efficiency, to their potential application in optical sensors for temperature and strain measurement. Additionally, theoretical modelling will be employed to provide deeper insights into the electronic structure and optical transitions within rare earth-doped scheelite materials. The research aims to offer a holistic understanding of these materials' optical behavior and their transformative potential in various technological domains, including materials science, photonics, renewable energy, and sensing technologies. Ultimately, this work aspires to catalyze innovative advancements in energy-efficient lighting, high-performance photovoltaics and advanced optical sensors.

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