Current progress and comparative study of performance of the energy saving lighting devices: a review

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Abstract. In the present scenario, rare earth activated phosphor materials are important families in luminescent materials, which is useful in various applications. Over the past few years, rare earth activated phosphor has gained a lot of attention from the society and research community due to its exceptional properties such as low cost, eco-friendly behavior, solution processability, better PL properties, wider range of color tunability, color purity and defects tolerance etc. In this review, we first discuss energy saving lighting devices, after that, we have discussed those methods which are used to synthesize rare earth activated phosphors. We have been focusing on the modification and tailoring of the photoluminescence of phosphors, which may lead to the acquisition of new phosphors with tunable emission colors. In this review, we are discussed recently reported color tunable phosphors. At the end of the review, scope in lighting field, energy saving devices, and future scope also discussed.

Keywords: luminescent materials; color tunability; photoluminescence; energy saving devices

1. Introduction

In a last few year, the consumption of energy of light sources concerning with biasing of light source became one of the major problems for the entire world. Thus, the main demand of the world economy and the global environment is to saving energy and reduction in the carbon emission and also the environmental cycles deflecting gases. The main lighting sources are candescent and fluorescent. Due to the very low luminous efficacy of an incandescent light and very limited life-time, incandescent light source was not enough source that reference for the energy saving purposes. The fluorescent light is more efficient as compared to the incandescent but fluorescent tubes are fragile and bulky in form. Although fluorescent light has a typical color rendering index (CRI) values in the range of 80-90 CRI (CRI measures the ability of light source to reproduces colour of various object related to the sunlight) there is also problem of disposal due to the presence of mercury. In addition, because of low power or energy circulation and long lifespan, compact fluorescent lamps (CFLs) have emerged as one of the alternatives to incandescent lamps or bulbs. But CFLs require a high initial input current. 220V AC current is not sufficient to start fluorescent lamps. This requires an electronic explosion to achieve the required 600–1000 high voltage ignition spike. [1]. Also, CFLs cannot operate in humid indoor, refrigerators and microwave ovens. At the present time, the research society hopes that the widespread use of the LEDs source of light as compared to the traditional light sources will reduce power consumption and support the environment worldwide. The current lighting system promotes the development of LEDs for an additional lighting system in the modernization era. Noble prize in physics (2014) honours the researchers (I. Akasaki, H. Amano, s. Nakamura) of high efficient blue LEDs which offers not only energy saving lighting source but also accrete the interest of researchers toward LEDs