Low temperature synthesis of NIR reflecting Bismuth doped Cerium oxide yellow nano-pigments

SheethuJose*,[a] Soumya B. Narendranath,[a] Deepak Joshy,[b] Sajith N. V.,[a]PratapachandraKurup M. R.,[a] Pradeepan Periyat*[b]

[a]Department of Chemistry, Central University of Kerala, Kasaragod, Kerala, India, 671531

[b]Department of Chemistry, University of Calicut, Calicut, Kerala, India, 673635

Corresponding author's e mail address: sheethujose@cukerala.ac.in, pperiyat@uoc.ac.in

ABSTRACT

A new series of yellow inorganic pigments possessing high solar reflectance based on bismuth doped cerium dioxide was synthesized by sol-gel hydrothermal method at 150 °C for 24 h. The band gap of developed nano-pigments changes from 2.89 to 2.58 eV, displaying colors ranging from pale yellow to bright yellow.

Keywords: Yellow Nano-pigments, NIR reflecting, Hydrothermal synthesis, Cerium dioxide

1. Introduction

Roofing materials possessing high solar reflectance garnered special attention in the current scenario of increasing global temperature and the demand of air-conditioned buildings. The solar spectrum comprises of 5% ultraviolet radiation (UV: 200-400 nm), 43% visible light (VIS: 400-700 nm), and 52% near-infrared radiation (NIR: 700-2500 nm) which is the heat generating region [1-3]. Recently, the inorganic pigments with high NIR reflection (cool pigments) are widely used as cool materials for building roofs and facades [4-6]. In spite of the highest solar and heat reflectance of white pigments, colored pigments are mostly preferred due to the disadvantages possess by the white pigments such as light pollution, poor stain resistance and monochromatic nature [7]. Colored NIR reflective pigments are mainly based on metal oxides