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Synthesis, structural, optical and electrical (DC) properties of a semiorganic Thiourea Barium Chloride (TBC) single crystal

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Abstract

In the present study, TBC single crystals were synthesized using solution evaporation method. The structural analysis of TBC crystal was studied using Powder X-ray diffraction. Optical properties of TBC crystals were carried out using UV-Vis, FTIR, Raman and photoluminescence (PL) spectra. The crystal shows absorbance maxima at 209 nm and transparent in the visible region 300-900 nm. The various optical constants such as refractive index, reflectance, speed of light, extinction coefficient, electrical susceptibility, dielectric constant, optical and electrical conductivity were evaluated. Thus results revealed that all these optical constants shows a strong dependence on optical absorption coefficient. Using single oscillator model (Wemple –DiDomenico), lattice dielectric constant and the ratio of free charge carrier to their effective mass were evaluated. The PL study of TBC crystals shows two emission peaks (419 nm –S, 441 nm- Ba) in blue region. The DC resistivity and conductivity of the crystal was investigated in the temperature range 26 °C - 115°C.

1. Introduction

Nonlinear optical (NLO) materials play a very important role in the field of telecommunication, optoelectronics, optical switching, optical signal processing and laser science [1–4]. The fabrication and designing of electro-optic and photonic devices are based on the development of relatively efficient nonlinear optical materials. Most of the organic crystals possess high optical nonlinearity, but poor mechanical strength and thermal stability [3–7], whereas inorganic crystals possess excellent mechanical and thermal properties although they show relatively modest nonlinearity due to the absence of extended π -electron delocalization [5]. These considerations have resulted in the development of new class of

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