

Thermal decomposition synthesis of nanorods bismuth sulphide from bismuth N-ethyl cyclohexyl dithiocarbamate complex

ABSTRACT

Nanorods of bismuth sulphide were prepared by thermal decomposition of bismuth N-ethyl cyclohexyl dithiocarbamate at different calcination duration. X-ray diffraction (XRD) analysis shows that at 400 °C, the precursor was fully decomposed to orthorhombic bismuth sulphide after 2 h of calcination. Besides, calcination duration does not affect the existence of Bi₂S₃ phase. Field emission scanning electron microscopy (FESEM) and transmission electron microscopy (TEM) analyses reveal that Bi₂S₃ nanorods with an average width ranging from 29–36 nm were obtained. Energy dispersive X-ray (EDX) analysis confirmed the atomic ratio of Bi and S close to 2:3, giving a possible composition of Bi₂S₃. Direct band gap energy of Bi₂S₃ decreases from 1.83 eV to 1.54 eV as calcination time increases.

Keyword: Semiconductors; Heat treatment; Nanostructures; Electron microscopy (TEM and SEM)