Oral Presentation

Characterization of the MgO/$GaSe_{0.5}S_{0.5}$ Heterojunction Designed for Visible Light Communications

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Abstract

In this study an optoelectronic design is reported and characterized. The device is made of p-type MgO solved in sodium silicate binder and n-type $GaSe_{0.5}S_{0.5}$ heterojunction. It is described by means of X-ray diffraction, optical absorption and reflection in the incident light wavelength range of 190-1100 nm and by means of dark and 406 nm laser excited current (*I*)-voltage (*V*) characteristics. The optical reflectance was also measured as a function of angle of incidence of light in the range of 35-80^{o}. The structural analysis revealed no change in the existing phases of the device composers. In addition, it was observed that for pure sodium silicate and for a 67% content of MgO solved in sodium silicate binder (33%), the heterojunction exhibits a valence band splitting of 0.45 and 0.70 eV, respectively. The painting of MgO improved the light absorbability significantly. On the other hand, the angle-dependent reflectance measurements on the crystal displayed a Brewster condition at 70^{o}. The MgO/ $GaSe_{0.5}S_{0.5}$ heterojunction exhibited no Brewster condition when irradiated from the MgO side. Moreover, for the crystal and the MgO/$GaSe_{0.5}S_{0.5}$ heterojunction, the dielectric spectral analysis revealed a pronounced increase in the quality factor of the device. The $I-V$ characteristics of the device revealed typical optoelectronic properties with high photoresponse that could amplify the dark current 24 times when irradiated with 5 mW power laser light. The structural, optical, dielectric and electrical features of the MgO/$GaSe_{0.5}S_{0.5}$ heterojunction nominate it for use in visible light communication technology

Keywords:Optical materials; Heterojunction; Impedance spectroscopy; Microwave