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Characterization of the MgO/GaSe0.5S0.5 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 GaSe0.5S0.5 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. The structural analysis revealed no change in the existing phases of the device compositors. 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 shift of 0.40 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. The MgO/ GaSe0.5S0.5 heterojunction exhibited no Brewster condition when irradiated from the MgO side. Moreover, for the crystal and the MgO/ GaSe0.5S0.5 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 photo-response 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/GaSe0.5S0.5 heterojunction nominate it for use in visible light communication technology. (C) 2015 Elsevier Ltd. All rights reserved.

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