Design and characterization of (Al, C)/p-Ge/p-BN/C isotype resonant electronic devices

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Abstract

In this work, a Ge/BN isotype electronic device that works as a selective microwave bandstop filter is designed and characterized. The interface is designed using a 50-m thick p-type BN on a 0.2-m thick p-type germanium thin film. The modeling of current-voltage characteristics of the Al/Ge/BN/C channel of the device revealed that the current is dominated by thermionic emission and by the tunneling of charged particles through energy barriers. The evaluation of the conduction parameters reflected a resonant circuit with a peak-to-valley current ratio of (PVCR) of 63 at a peak (V-p) and valley (V-v) voltages of 1.84 and 2.30V, respectively. The ac signal analysis of the Al/Ge/BN/C channel that was carried out in the frequency range of 1.0-3.0GHz displayed a bandstop filter properties with notch frequency (f(n)) of 2.04GHz and quality factor (Q) of 102. The replacement of the Al electrode by C through the C/Ge/BN/C channel caused the disappearance of the PVCR and shifted f(n) and Q to 2.70GHz and 100, respectively. The features of the Ge/BN device are promising as they indicate the applicability of these sensors in communication technology.

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KeyWords Plus: DIODES; SIZE

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