Study of low temperature epitaxial growth for Ⅱ-Ⅵ compound semiconductors

2000

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This paper is the research on low-temperature epitaxial growth and the evaluation of Ⅱ-Ⅵcompound semiconductors for radiation detector using remote plasma enhanced metal organic chemical vapor deposition (RPE-MOCVD) method. THe crystal growth for the radiation detectors and impurity doping was mainly carried out.

High quality ZnSe epitaxial growth has been obtained, which is specified by the introduction of hydrogen atomic radical into reaction region with source materials. The low resistivity n-type ZnSe epitaxial layers with the highest carrier concentration of 8.2×10^{19} cm^{-3} are obtained using n-BuI as a dopant source. It has been found that epitaxial growth of ZnTe layers can only be achieved with enough hydrogen radicals. And these growths are observed in substrate temperature region above 150℃. The low resistivity p-type ZnTe layers with the carrier concentration of 3.2×10^{19} cm^{-3} are obtained when a mixture gas of H_2 and N_2, or NH_3 is introduced into plasma source.

The research on epitaxial growth and doping technique of ternary alloys CdZnTe and CdSeTe crystal was carried out in order to produce p-i-n junction device for the radiation detector of the crystal lattice-matching system. It is possible to obtain p-CdZnTe layers by nitrogen radical doping and n-CdSeTe layers by iodine doping. Using these CdZnTe system materials, it was possible to establish the base to fabricate the radiation detector device with the p-i-n structure.