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Laser Raman spectroscopy of phase transformation in GaAs induced by radiation defects

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Abstract

When implanting (111) GaAs with boron and heavier argon ions, severe distortion of crystal structure occurs. The Raman scattering has shown that with implanted ion dose change the crystal structure gradually transforms into disordered state, in which coexistence of crystalline, microcrystalline, nanocrystalline and amorphous phases is possible. At the certain stage of implantation the formation of continuous amorphous layer of GaAs takes place. The critical doses of disorder and amorphization of GaAs at implantation with B and Ar ions accordingly have been defined. The graphs of dependence of LO and TO phonon halfwidths upon implantation doses are also the characteristics of amorphization. The possibility of estimation of quantitative portions of the amorphous and nano phases from the Raman-spectra is emphasized. It is shown experimentally that using light ions to synthesize nano GaAs most likely is more advantageous: the nano phase synthesizes in the wide range of fluencies (at high fluencies too). (© 2013 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim)

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