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To verify the piezoelectric properties of carbonate apatite ceramics, the flexural strength and Young's modulus were measured using nanoindentation. The flexural strength and Young's modulus of the surface layer of the ceramic were 30 MPa and 3.0 MPa, respectively, and those of the central layer were 16 MPa and 3.3 MPa, respectively. In general, the flexural strength and Young's modulus were higher in the surface layer than in the central layer. ’The non-transparent wafer is a most promising optical material for photovoltaic devices, and the bandgap energy of the photovoltaic device can be determined by the transparent wafer. We report the fabrication of GaAs-based solar cells with a maximum energy conversion efficiency of 7.53% using thin (50 nm) epitaxial GaAs/AlGaAs wafers that exhibit complete transparency in the visible light wavelength region. The wafer was prepared by the (111)B oriented MOCVD technique. To evaluate the effect of the epitaxial growth condition on the wafer performance, the thickness of the epitaxial layer was controlled by changing the growth time during the MOCVD process. The transmittance of the wafer with a thickness of 50 nm was 85.6% at 550 nm, which indicates that the wafer is transparent in the visible light wavelength region. GaAs/AlGaAs epitaxial wafers with a thickness of 500 nm exhibited the maximum energy conversion efficiency of 7.30%. An SiO2 layer of 150 nm thick was

formed on the epitaxial layer to prevent the photogenerated carriers from recombining at defects. The energy band-gap of the SiO2 layer is more suitable for the radiative recombination of photogenerated carriers than that of the AlGaAs layer, because the recombination of the photogenerated carriers occurs mainly at the interface of the AlGaAs and GaAs layers. The energy band-gap of the GaAs layer was measured to be 1.53 eV by the near band-edge absorption and the direct transition. By using the principles of superconductivity, we studied the charge-spin plasmon in a doped magnetic metal-oxide superconductor thin film, composed of a magnetic metal (Cu) film coated with a boron-doped superconductor (YBCO) film.

July 6, 2021 â€" Lead-Free Piezoelectric Materials provides a detailed overview of the principles, material systems, and applications of lead-free piezoelectric materials. fffad4f19a