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Optical and Photoelectric Properties of Calcium-Doped Pb_2CrO_5 Thin Films

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Optical and photoelectric properties of calcium-doped Pb_2CrO_5 thin films prepared by an electron-beam evaporation (EBE) deposition technique are described. Band-gap energies of the thin films are extracted from the measurement of the transmittance and reflectance coefficients of the films. Obtained band-gap energies for pure and calcium-doped samples range from 2.36 eV to 2.29 eV. The photoresponse of the photodetectors fabricated with the thin film samples is examined as functions of light wavelength, applied voltage, light intensity, and modulation frequency of irradiation. The measured photoelectric properties of the thin film photodetectors show the same tendency, although the stability of the sensitivity is rather advanced in the calcium-doped samples.

1. Introduction

Pb_2CrO_5 is one of the new types of photoelectric materials. Pb_2CrO_5 was discovered by Negas to be a dielectric material belonging to the PbO-chromium oxide system.[1] Recently, a photovoltaic effect was observed in a Pb_2CrO_5 ceramic using a pair of planar electrodes.[2] More detailed characteristics of Pb_2CrO_5 in the form of a thin film were examined.[3] A Pb_2CrO_5 photodetector array has been developed by using a highly oriented Pb_2CrO_5 thin film fabricated by electron-beam evaporation (EBE) deposition.[4] The light-sensitive device using the Pb_2CrO_5 thin film is characterized by a very low dark current, a spectral response in visible regions, and a simple planar structure. At present, there are some problems for practical applications: the low stability and poor improvement of response to red light.