Applied Surface Science
Volumes 175-176 , 15 May 2001, Pages 326-331

doi:10.1016/S0169-4332(01)00136-2 Cite or Link Using DOI

Growth of organic films on passivated semiconductor surfaces: gallium arsenide versus silicon

T. U. Kampen, G. Salvan, D. Tenne[1], R. Scholz and D. R. T. Zahn

Institut für Physik, Technische Universität Chemnitz, D-09107 Chemnitz, Germany

Accepted 13 December 2000 Available online 7 May 2001.

Abstract

We have investigated the growth of perylene-3,4,9,10-tetracarboxylic-dianhydride (PTCDA) on hydrogen-passivated Si(1 0 0) and sulfur-passivated GaAs(1 0 0) using in situ Raman spectroscopy. The Raman spectra provide information on the internal vibrational modes of the organic molecules as well as on external vibrational modes, or, in other words, phonons. PTCDA films grown on both types of substrates show vibrational modes which correspond to the phonon modes of PTCDA single crystals. The presence of phonon modes in the Raman spectra provides evidence of their crystalline structure. Their intensity, full width at half maximum (FWHM), and polarization dependence can be employed to determine the appropriate substrate for the growth of PTCDA films with high structural quality.

The experimental results show that PTCDA films grown on sulfur-passivated GaAs(1 0 0) at 410 K substrate temperature are still polycrystalline but show the best structural properties. The FWHM of the phonon modes measured on these films are decreased for substrate temperatures of 350 and 410 K. Phonon as well as internal vibrational modes show a dependence on the polarization geometry, which has so far only been observed in PTCDA crystals up to now.

Author Keywords: PTCDA; Silicon; Gallium arsenide; Passivation; Vibrations; Raman spectroscopy

PACS classification codes: 78.30 Jw; 78.55 Kz; 78.66.Qn

[1] Permanent address: Institute of Semiconductor Physics, pr. Lavrenteva 13, 630090 Novosibirsk, Russia.

Corresponding author. Tel.: +49-371-531-3079; fax: +49-371-531-3060; email: kampen@physik.tu-chemnitz.de