

Full Text: [[HTML](#) [Sectioned HTML](#) [PDF](#) (65 kB) [GZipped PS](#)] [Order](#)

Organic modified Schottky contacts: Barrier height engineering and chemical stability

[T. U. Kampen](#), [S. Park](#), and [D. R. T. Zahn](#)

Institut für Physik, TU Chemnitz, D-09107 Chemnitz, Germany

(Received 1 August 2002; accepted 27 January 2003; published 19 March 2003)

The electronic properties of Ag/GaAs(100) contacts were modified using interlayers of 3,4,9,10-perylene-tetracarboxylic dianhydride (PTCDA). The influence of the organic films on the electronic transport properties was investigated using current–voltage (I – V) and capacitance–voltage (C – V) measurements. The *in situ* I – V curves reveal a strong dependence on the PTCDA interlayer thickness d_{PTCDA} . The effective barrier height varies between 0.81 and 0.64 eV by changing d_{PTCDA} between 0 and 60 nm. For a layer thickness above 5 nm space-charge limited currents in the organic layer strongly influence the carrier transport in the diodes. The C – V characteristics do hardly vary upon introducing an organic interlayer with d_{PTCDA} below 30 nm. The capacitance of the organic film is larger than that of the depletion layer within the GaAs substrates, the latter one being unaffected by the PTCDA modification and dominating the C – V characteristics. Therefore, the change in the effective barrier height can be explained by an increasing image-force lowering in the presence of the organic interlayer. Exposure of Ag/PTCDA/GaAs(100) contacts with $d_{\text{PTCDA}} = 30$ nm to oxygen results in an increase in effective barrier height to a value comparable to the one of a bare Ag/GaAs(100) Schottky contact. This sensitivity to air is attributed to oxygen induced deep traps. This results in a shift of the Fermi level from its original position of 2 eV above the highest occupied molecular orbital towards the middle of the band gap of PTCDA. ©2003 American Vacuum Society.

[doi:10.1116/1.1562636](https://doi.org/10.1116/1.1562636)

PACS: 73.40.Ns, 73.30.+y, 72.20.Ht, 73.20.At [Additional Information](#)

View ISI's Web of Science data for this article: [[Source Abstract](#) | [Related Articles](#)]

Full Text: [[HTML](#) [Sectioned HTML](#) [PDF](#) (65 kB) [GZipped PS](#)] [Order](#)