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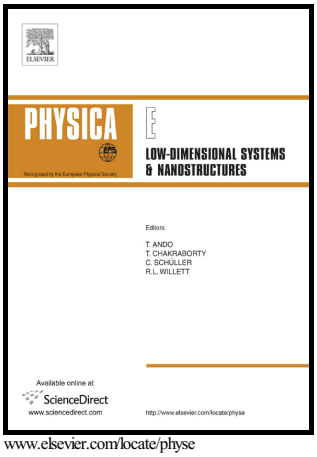

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Analysis of photoconductive mechanisms of organic-on-inorganic photodiodes

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Abstract

In this work, it is shown that choosing an organic-on-inorganic Schottky diode for photoconductive sensing by a using a power law exponent (PLE or γ) determined at a single bias point is a limited approach. The standard literature approach does not highlight any bias voltage effects on the distribution of interface state density and other operationally important parameters. In this paper we suggest a new empirical method that holistically highlights the variation of γ with voltage, irradiance and temperature to reach a more informed choice of photosensor for real applications. We obtain a simple, plausible relation of the variation of barrier height, Φ, with voltage, irradiance and temperature. The method is evaluated with data collected previously for Schottky diodes of structure Al/p-Si/organic-semiconductor (OSC)/Au, where OSC is Coumarin-doped with graphene oxide (GO), Cobalt Phthacyanine (CoPC) doped with GO or PCBM doped with GO, respectively. The method reproduces published data for the three diodes reported at specific bias and provides for the first time some qualitative evidence of barrier height variation with light intensity, for which a possible physical basis is also given. Typically, Schottky barrier height is characterized using dark current leading to an under reporting of the effect of illumination on barrier height. Finally,