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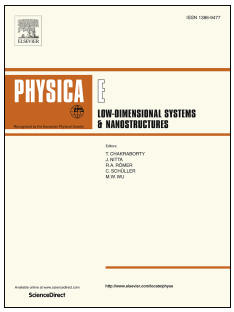

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Change in Reflectance Spectrum of Nanoporous Silicon by Gas Adsorption

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ABSTRACT

In this paper, we propose a new strategy to improve the performance of nanoporous silicon (np-Si) layer-based optical gas sensors. For this, we fabricated the np-Si layer on a p^+-type silicon substrate and modified the surface wettability of the np-Si layer with oxygen (O_2) plasma treatment. We then compared the changes in the reflectance spectra of the O_2 plasma-treated np-Si layer that had been exposed to various organic vapors with that of the untreated np-Si layer. The results by measuring the contact angle on the surface confirmed that the surface of the O_2 plasma-treated np-Si layer was hydrophilic. During the exposure to the organic vapors, there was a reversible red-shift phenomenon in the reflectance spectrum. This study confirmed that the red-shift can be attributed to the changes in the refractive index induced by the capillary condensation of the organic vapor within the nanopores of the np-Si