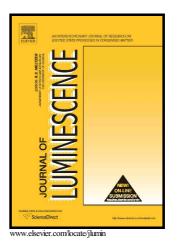
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Comparison of Light Emitting Capacitors with textured and polished silicon substrates towards the understanding of the emission mechanisms

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Abstract

We experimentally compare characteristics of Light Emitting Capacitors (LECs) using textured and polished silicon surface. The goal of this work is to investigate the influence in the LECs electro-optical properties with the use of roughening silicon surfaces and off-stoichiometric silicon oxide (SiO_x). The textured surface is generated by reactive ion etching using Ar and SF₆ as ion sources. The textured substrate exhibits an average roughness of 4.0 ± 0.2 nm with spike density of $3.7\pm1.8 \times 10^{10}$ cm⁻². The SiO_x is deposited by low-pressure chemical vapor deposition on polished and textured substrates. LECs with textured substrate diminish the turn-on electric field from 8.5 MV/cm to 7.0 MV/cm and improve the power conversion 4.1 times compared with LECs on polished substrate. Furthermore, in LECs with textured substrate the electrical current increases at the initial low voltages and in the high current regimen the initial increase is sustained. The spikes on the silicon substrate improve carrier injection at low electric fields, causing more trapping of electrons in the SiO_x and enhancing the electroluminescence response at high electric fields. An explanation of the electro-emission mechanisms is proposed. Also, a Download English Version:

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