

Influence of injection level of charge carriers in nanostructured porous silicon on electroluminescence quantum efficiency

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Electroluminescence in porous silicon (PS) has been less studied than photoluminescence [1]. Anyway, the most perspective practical use of porous silicon as the material for making light emission devices. Light emission diodes and flat color displays is directly associated with its electroluminescence. Electroluminescence oscillator based on porous silicon might be reduced to a micron size scale and integrated with other semiconductor elements on single silicon crystal. It could result in stage of information and computer technologies development.

The given work contains electroluminescence characteristics in Al/PS-(c-Si)/Al structures. Here the mechanism of electroluminescence and also influence of injection level of quantum efficiency has been studied. Internal quantum efficiency depends on injection coefficient of high-ohmic compensated layer and probability of efficiency recombination in porous silicon.

Sector of avalanche multiplication on current-voltage characteristics corresponds to threshold bias of electroluminescence [2]. Intensity of breakdown through heterostructures also increases by generation of minority charge carriers due to re-absorption of luminescent emission. Under low injection levels of charge carriers the quantum efficiency goes down due to reduction of minority charge carriers current. Thus, the given structures combine properties of optical emissions source with voltage stabilizer.

[1] Cullis A.G., Canham L.T., Calcot P.D.G. The structural and luminescence properties of porous silicon. *Appl. Phys. Rev.* Vol. 82 (3), 1997, P. 909-965.

[2] Timokhov D.F., Timokhov F.P. Avalanche multiplication of charge carriers in nanostructured porous silicon. *Semiconductor Physics Quantum Electronics & Optoelectronics* v.6, 3, 2003. P. 307-310.

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