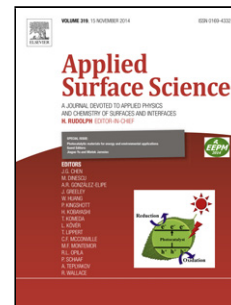


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Electrically pumped random lasing from hydrothermal ZnO films of large grains

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Abstract

We have prepared ZnO films with ~700 nm sized grains on silicon substrates by a simple hydrothermal process. Then, metal-insulator-semiconductor (MIS) structured devices based on such ZnO films have been fabricated in order to achieve low-threshold electrically pumped random lasing (RL). It is found that the MIS structured device using the as-grown hydrothermal ZnO film exhibits a lower RL threshold current than most of our previously reported devices using the sputtered or hydrothermal ZnO films of much smaller grains, indicating the feasibility of using ZnO films of large grains to improve the RL performance. However, the RL threshold current of the MIS structured device using the hydrothermal ZnO film subjected to 700 °C anneal is unexpectedly ~10 times that of the device using the as-grown hydrothermal ZnO film. This is due to that the 700 °C anneal results in deep pores and more defects in the hydrothermal ZnO film, which in turn leads to not only the larger optical loss but also the smaller optical gain. Such an unexpected result suggests that

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