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Nonlinear response of porous silicon thin films in short-infrared region

Rihan Wu
University of Birmingham, UK

Porous Silicon has attracted great interests in recent years due to its unique opto-electronic properties. The nanoscale sponge-like structure of porous silicon enhances the quantum confinement effect and resulting in faster carrier transport, enhanced photo-luminescence efficiency and optical nonlinearities in comparison with conventional crystalline silicon. These improvements lead to a wide range of potential applications in the field of optical sensing, energy conservation and photonic devices. Among all the applications, the enhanced nonlinearities of porous silicon can be either an issue or advantage. For a better understanding of the nonlinear properties, our work explores the self-focusing and two photon absorption process in free-standing porous silicon thin films by employing z-scan technique in short-infrared wavelength region. In addition, Pump-probe technique has also been used to investigate the influence of free carrier injection on the third order nonlinearities.

rxw593@bham.ac.uk