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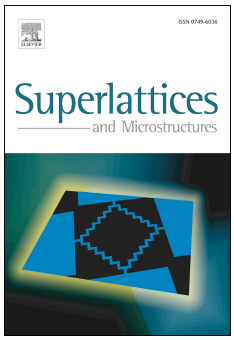

Spin relaxation of indirect excitons in asymmetric coupled quantum wells

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Spin relaxation of indirect excitons in asymmetric coupled quantum wells

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Abstract

Density and spin dynamics of indirect excitons in asymmetric GaAs/AlGaAs coupled quantum wells is studied by time-resolved photoluminescence. Under electric bias applied in the growth direction the lifetime of indirect excitons formed by an electron in a wide and hole in a narrow quantum well reaches 12 ns, while the circular polarisation lifetime is about 5 ns. The structure is suited for further studies of dark indirect excitons by time-resolved pump-probe spectroscopy.

Keywords: Indirect exciton, Spin relaxation, Coupled quantum wells

1. Introduction

A semiconductor exciton is a quasiparticle that consists of an electron bound to a hole via Coulomb interaction [1, 2]. Due to their bosonic nature, excitons are expected to allow for a Bose-Einstein condensate (BEC) at low temperatures [3]. However, experimental observation of BEC of excitons is challenging because the lifetime of excitons is usually too short to allow cooling to low temperature in a regular semiconductor [4, 5]. Indirect excitons (IXs), bound pairs of electrons and holes in spatially separated quantum well (QW) layers, have a major advantage over ordinary excitons in bulk systems, i.e., long lifetime, as compared to exciton cooling time [6, 7, 8, 9]. The long lifetime results from the reduced overlap of electron and hole