

Abstract Submitted
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Unexpected

Anisotropy of Electron g-factor in GaAs/AlGaAs(110) Quantum Well

YANG JI, SKLSM, Institute of Semiconductors, CAS — Semiconductor spin qubit is a promising candidate for solid state quantum computation. A lot of effort has been devoted to study spin dynamics in semiconductors ever since a revival of research interest in this field in the late 1990s. Spin lifetime longer than 1ns at room temperature has been discovered in GaAs/AlGaAs(110) quantum wells (QW) as a result of the absence of a predominant spin scattering mechanism (DP mechanism), which also leads to a strong anisotropy of electron spin decoherence in such QWs, with the spin lifetime of spins along the growth direction 10 times bigger than that of spins perpendicular to the growth direction. However, not much is known about the (an)isotropy of spin-related processes in the (110) QW plane, despite that it may offer useful information about spin relaxation. Utilizing a time-resolved Kerr rotation (TRKR) system with a rotatable in-plane magnetic field, we studied the spin processes in GaAs/AlGaAs (110) QWs and found an unexpected anisotropy of electron g-factor in such QWs. The g-factor as measured with the magnetic field along the [1-10] axis is some 10% larger than that along the [001] axis. Such a strong anisotropy is not only unexpected for QWs, but also much bigger than that found in InGaAs/GaAs quantum dots. An explanation for these results is still in demand but it may give some hints to improve our understanding of spin dephasing mechanisms in semiconductors.

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