

Spin Coherence and Spin Memory Effects in InAs Self-Assembled Quantum Dots

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Ultrafast pump-probe measurements on ensembles of InAs self-assembled quantum dots will be reported. Both coherent and incoherent effects are observed in the pump-probe dynamics. The coherent effects will be shown to arise from quantum beats arising from the anisotropic exchange interaction of charge neutral dots.

The incoherent effects are shown to arise from charged quantum dots, where the exchange interaction is quenched by the requirements of the Pauli exclusion principle. The incoherent phenomena form the basis of spin memory phenomena where the circular polarisation of the incident photon is transferred to that of the spins of up to 50% of the quantum dots.

The results will be contrasted with findings from single dot spectroscopy of charge neutral and negatively and positively charged trions.