Polarization Possibilities of Small Spin-Orbit Interaction in Strained-Superlattice Photocathodes

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ABSTRACT

The strained-superlattice structure based on GaAsP/GaAs, with a maximum polarization as high as 90% and more than 1% quantum efficiency, is presently the prime candidate for the ILC polarized electron photocathodes. A recent systematic study shows, however, that the peak polarization seems saturated even though the heavy-hole and light-hole band splitting is increased significantly, indicating that there is a material specific spin relaxation mechanism. It is widely accepted that the D'yakonov-Perel mechanism is the dominant spin relaxation mechanism in the III-V compound superlattice structures, and that the spin relaxation can be reduced by choosing a material with a smaller spin-orbit interaction. As the spin-orbit interaction in phosphides is much smaller than in arsenides, we have investigated the strained-superlattice structure based on InGaP/GaAs. The paper describes preliminary results on polarized photoemission.