# Rashba spin-orbit interaction in vertical $In_{0.05}Ga_{0.95}As/GaAs$ quantum dots

**S. M. Huang**[a], A.O. Badrutdinov[a], L. Serra[b], T. Kodera[c], T. Nakaoka[c], N. Kumagai[c], Y. Arakawa[c], D. A. Tayurskii[d], K. Kono[a], and K. Ono[a]

[a]Low Temperature Physics Laboratory, RIKEN, Wako-shi, Saitama 351-0198, Japan
[b]Institut de Física Interdisciplinar i de Sistemes Complexos IFISC (CSIC-UIB), E-07122 Palma de Mallorca, Spain
[c]Nanoquine, The University of Tokyo, 4-6-1 Komaba, Meguro, Tokyo 153-8904, Japan
[d]Physics Department, Kazan Federal University, 420008, Kazan, Russia

We study the spin splitting energies of different orbital states in $In_{0.05}Ga_{0.95}As/GaAs$ quantum dots. The measured results show that the spin splitting energies of $|0,0\rangle$ are larger than those of $|0,-1\rangle$. The theoretical analysis is done with a generalization of the Fock-Darwin states in the presence of spin-orbit interactions. The Rashba spin-orbit intensity is in the range of 80 meVÅ $\leq \lambda_R \leq$ 120 meVÅ. The enhancement of spin-orbit intensity can be understand as the penetration of wavefunction into quantum well. Due to the strong deviation of eavefunciton distribution in a quantum well, Rashba spin-orbit intensity increases significantly in this type of low potential barrier heterostrucutre.