

We report polarization-resolved high spectral resolution photoluminescence measurements in self-assembled strain-free GaAs/Al_{0.3}Ga_{0.7}As quantum dots designed and realized in order to reduce as much as possible strain and segregation, which affected previous fine-structure splitting FSS experiments. Photoluminescence from isolated quantum dots exhibits a linearly polarized FSS. FSS clearly shows a quantum size effect monotonically decreasing from 90 to 20 eV by decreasing the quantum dot size increasing emission energy. While this finding is similar to that observed in strained InGaAs/GaAs quantum dots, clearly it requires a different explanation, being our quantum dots not affected by strain-induced piezoelectricity. We ascribed the observed FSS to a size dependent reduction in dot shape anisotropy as evidenced by structural data analysis. Moreover the linear polarization in dots with shape close to cylindrical symmetry is not along the $\langle 110 \rangle$ crystallographic axis but it turns out randomly distributed, highlighting the role of extrinsic effects.