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**Non-linear piezoelectric polarization in III-V and nitride semiconductors** PIERRE-YVES PRODHOMME, ANNIE BEYA-WAKATA, GABRIEL BESTER, Max-Planck-Institut für Festkörperforschung — Piezoelectricity can have a large impact on the electronic and optical properties of quantum well and quantum dots based devices such as lasers, light emitting diodes, infrared photodetectors. In particular it has been shown to be important in III-V and nitride semiconductors. The piezoelectric effect in quantum Well or in Quantum Dots is usually taken into account by neglecting the non linear term in the piezoelectric tensor. We have calculated the second order piezoelectric tensor for all the III-V (including the nitrides) semiconductors in the Wurtzite and Zincblende structure. And we have derived a relation between the proper and the improper second order piezoelectric coefficients. This relation is used to calculate the proper coefficients which are the experimentally measurable ones. We have calculated the piezoelectric field in several Quantum wells and compare our values to experiment. We show that the second order can be so large for Zinc-Blende materials that it cancels the first order term, we demonstrate also that for Nitrides this effect is much lower. However we show that for severely strained structure such as quantum dots or thin films, the second order piezoelectric effect can even exceed the spontaneous polarization in the nitrides.

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