

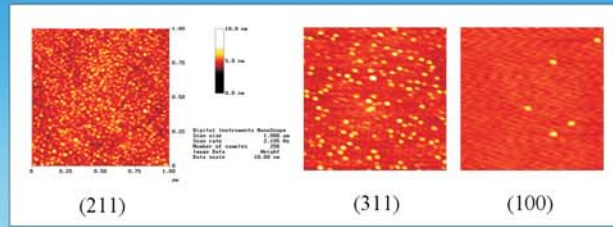
PA-PIE

PIEZOELECTRIC EFFECTS IN InGaAs/GaAs(N11) QUANTUM DOTS

UdR Milano Bicocca: M. Gurioli, S. Sanguinetti, P. Altieri, E. Grilli, M. Guzzi
 UdR Firenze: A. Vinattieri, D. Alderighi, P. Guicciardi, V. Emiliani
 UdR Roma Tor Vergata: A. Di Carlo, M. Povolotskyi
 UdR Lecce: A. Passaseo, R. Rinaldi, E. Piscopello, S. De Rinaldis, I. Tarantini
 Walter Schottky Institute, TU Munich: S. Birner, S. Hackenbuchner, P. Vogl

Scope of the project is the study of the effects of piezoelectric field on the optical properties and carrier dynamics in (N11) InGaAs QDs

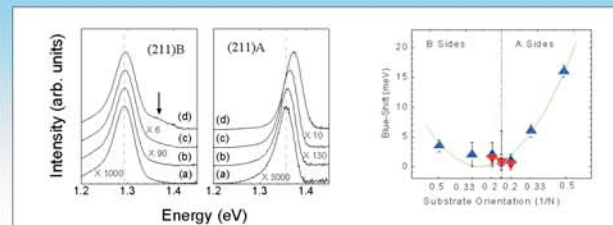
MOCVD growth & AFM characterization



RESULTS

- Very low density achievable
- MOCVD growth of (N11) QDs
- Different kinetics of the QD nucleation on (N11) substrates

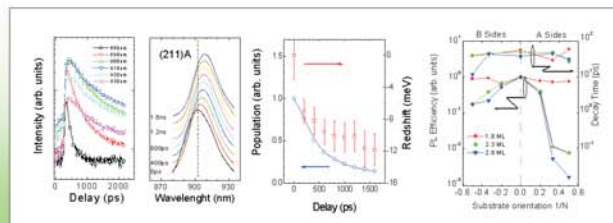
Quantum Confined Stark Effect (QCSE)



RESULTS

- Blue shift of the PL with increasing the carrier injection
- Presence of a built-in field
- Dependence on N and A/B termination asymmetry

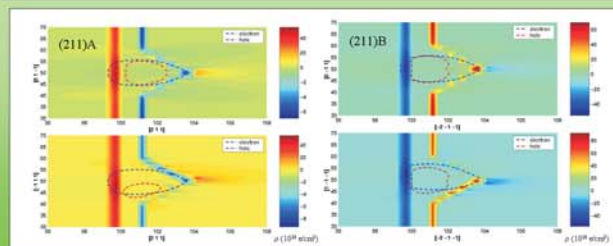
Carrier dynamics & recombination kinetics



RESULTS

- Non linear carrier kinetics with dynamical QCSE
- Built-in fields are intrinsic
- Increase of the radiative lifetime

Map of the piezo charge density & $|\Psi|^2$



RESULTS

- Dipolar piezoelectric field
- Spatial separation of electrons and holes
- Asymmetry between A/B termination

PUBLICATIONS

Gurioli, M, et al. *Dynamic quantum-confined stark effect in (N11) InGa QDs* Appl. Phys. Lett. 78, 931 (2001)
 Sanguinetti, S et al. *Piezoelectric effects on InGa/GaAs(N11) QDs* Physica Status Solidi B 224, 111 (2001)

S. Sanguinetti, et al. *Influence of intrinsic internal field on recombination kinetics of (N11) QDs*, Eur. Phys. J. B (2002)
 S. Sanguinetti, et al. *Built-in electric fields in of InGa quantum dots grown on (N11) GaAs substrates* Microelectronics Journal (2002)