

DOTSENSE (GaN quantum dots as optical transducers for chemical sensors) is a FP 7 STREP that started in May 2008 and targets on the application of GaN/AlN quantum dot superlattices (QDSLs) as optical transducers in chemical sensors. The consortium consists of five partners with expertise in MBE growth of quantum dot superlattices, structural and microscopic analysis, optical spectroscopy, device processing and characterization as well as application in avionic systems.

Partners

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Technical details

Chemically induced variations in the surface potentials of GaN/AlN QDSLs alter their luminescence properties. Optical readout of these variations allows the detection of hydrogen or hydrocarbons in gases as well as of specific ions in aqueous environments. The detection of hydrogen with different GaN/AlN QDSLs has recently been demonstrated (Fig.1).

Recent progress on growth of GaN quantum dots in different crystal orientations, their structural characterization and their optical properties as well as the realization of hydrogen sensitive QDSL devices has been reported in the references listed below [1-5].

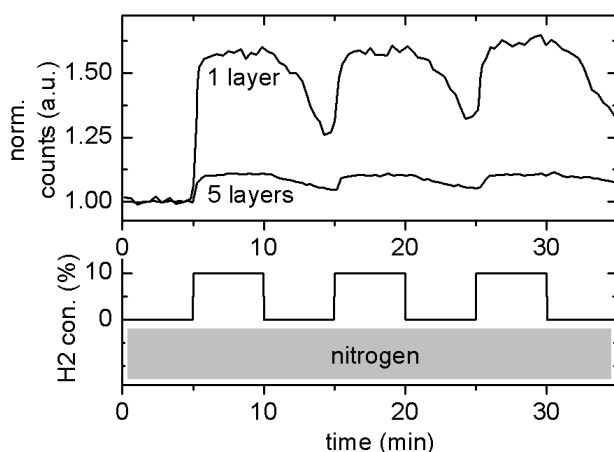


Figure 1

Transient response of the emission intensity of GaN/AlN QDSL devices with a catalytic Pt top layer, each measured at a fixed detection wavelength near the emission maximum, to 10% H₂ in nitrogen [2].



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Recent Publications:

- [1] *Stranski–Krastanow growth of (112-2)-oriented GaN/AlN quantum dots*, L. Lahourcade, S. Valdueza-Felip, T. Kehagias, G.P. Dimitrakopoulos, P. Komninou, E. Monroy, Appl. Phys. Lett. 94, 111901 (2009).
- [2] *GaN quantum dots as optical transducers for chemical sensors*, O. Weidemann, P.K. Kandaswamy, E. Monroy, G. Jegert, M. Stutzmann, M. Eickhoff, Appl. Phys. Lett. 94, 113108 (2009) .
- [3] *GaN/AlN short-period superlattices for intersubband optoelectronics A systematic study of their epitaxial growth, design, and performance*, P.K. Kandaswamy, F. Guillot, E. Bellet-Amalric, E. Monroy, L. Nevou, M. Tchernycheva, A. Michon, F.H. Julien, E. Baumann, F.R. Giorgetta, D. Hofstetter, T. Remmele, M. Albrecht, S. Birner, Le Si Dang, J. Appl. Phys. 104, 093501 (2008) .
- [4] *Interband and intersubband optical characterization of (11-22)-oriented GaN/AlN multiple-quantum-well structures*, L. Lahourcade, P.K. Kandaswamy, J. Renard, P. Ruterana, H. Machhadani, M. Tchernycheva, F.H. Julien, B. Gayral, E. Monroy, Appl. Phys. Lett. 93, 111906 (2008).
- [5] *Polar AlN/GaN interfaces: Structures and energetics*, J. Kioseoglou, E. Kalesaki, L. Lymperakis, G. P. Dimitrakopoulos, Ph. Komninou and Th. Karakostas, accepted in Phys. Stat. Sol. (a).
- [6] *Core models of a-edge threading dislocations in wurtzite III(Al,Ga,In)-Nitrides*, J. Kioseoglou, Ph. Komninou, and Th. Karakostas, accepted in Phys. Stat. Sol. (a)



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