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COLLOQUIUM  
DI  
DOTTORATO

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Data: 31 Marzo 2015  
Ora: 15.00  
Aula: U4-08

Fundamental differences between traditional III-V compounds  
and Nitride Semiconductors:  
the formation and role of extended defects.

This talk will address the fundamental question as to why the performance of minority carrier devices based on nitride semiconductors is insensitive to high concentration of extended defects, which is not the case for traditional III-V compounds. The key factors contributing to this findings are: (a) the chemical bonds in nitrides are strongly ionic while are mostly covalent in III-V compounds; b) the nitrides can exist in the wurtzite structure (equilibrium) and the cubic structure (metastable) and the enthalpy of formation of the two allotropic forms differs by only a few meV; (c) additional band structure potential fluctuations exist in the InGaAlN alloys due to alloy disorder as well as phase separation and unique types of long range atomic ordering. The consequences of these differences will be discussed.