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### *Structural investigation of GaAsBi nanostructures by Synchrotron Radiation techniques*

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Abstract: Synchrotron radiation techniques, in particular X-ray diffraction (XRD) and absorption (XAFS), are nowadays well-established tools to study the structure of both crystalline and disordered/amorphous semiconductor materials. The high brilliance of the X-ray beam in modern synchrotron radiation sources has opened the way to the analysis of low dimensional systems such as nanostructures as well as the local environment of dopants and dilute isoelectronic impurities in a semiconductor matrix. In the case of InGaAsN dilute nitrides, for example, XAFS allowed us to measure the relative number of In-N and In-As bonds and to give evidence of In-N ordering as a function of annealing time [1].

More recently, we have performed XAFS experiments on GaAsBi epilayers with relatively low concentration (in the range 0-2.5%) and our data indicate that Bi pairing and clustering take place as the Bi concentration increases [2]. Such deviation from the random distribution of anions in the alloy may give an explication for some of the anomalous optical and electronic properties observed in these alloys. In this presentation, we will show the new results of the extension of our analysis to samples with higher Bi concentration (up to 11%) where static disorder, which origin is still under investigation, dramatically affects the XAFS spectra. This analysis will be accompanied by XRD and Multiwavelength Anomalous Diffraction (MAD) characterization performed with synchrotron radiation, in order to obtain a complete picture of both short- and long-range order structural properties of dilute bismides.

#### References:

- [1] G. Ciatto, F. D'Acapito, L. Grenouillet, H. Mariette, D. De Salvador, G. Bisognin, L. Floreano, R. Gotter, S. Mobilio and F. Boscherini, "A quantitative determination of short range ordering in  $\text{In}(x)\text{Ga}(1-x)\text{As}(1-y)\text{N}(y)$ ", *Physical Review B* 68, 161201(R) (2003).
- [2] G. Ciatto, E. C. Young, F. Glas, J. Chen, R. Alonso Mori, and T. Tiedje, "Spatial correlation between Bi atoms in dilute GaAsBi: from random distribution to Bi pairing and clustering", *Physical Review B* 78, 035325 (2008).