Optical instabilities and blinking phenomena in InGaN quantum wells

Kotaro Oikawa, Christian Feldmeier, Tsutsumi Toshiaki, Takayuki Okamoto, Kentaro Takatori and Ruggero Micheletto
Department of Nanosystem Science, Yokohama City University
22-2 Seto, Kanazawa-ku, Yokohama, 236-0027 Japan
Email: ruggero@yokohama-cu.ac.jp

The blinking of InGaN optical devices is studied in high details. We will describe a model to explain the optical process that causes the blinking. We consider that the optical intensity observable from a device is proportional to the number of recombination of carrier per unity of time. This recombination rate is dependent on several factors in the quantum well. We will describe a model that takes in account the nanoscale thermal vibrations that occur in the quantum well and that actually shift the quantum well thickness. The variation of the thickness occurs at very high frequencies and in not-coherent way, however the interaction of adjacent vibration produce interference that results in observable random beating of much lower frequencies. Also, a methodology that uses surface plasmon resonance to induce better adsorption and efficiency on next generation solar cells will be outlined.

Ruggero Micheletto got his PhD in Solid State Physics in 1992 from the University of Bologna in Italy. He worked as post-doctoral fellow in Japan at the Kanagawa Academy of Science first, then he continued his research career in Optics and Solid State optics in Riken, Japan. He was then promoted assistant professor at Kyoto University in 1999 and continued his academic career until he was elected Associated professor in 2008 and full professor in 2012 at Yokohama City University, his current position.

Prof. Micheletto has 43 scientific publications in high standard international journals, about 100 publications in total. Best technical paper of the year awarded by the Japanese Society of Surface Science (2000), a patented method for nano- particles deposition cited by independent authors as "Micheletto method". He was awarded multiple research grants, in years 2004-2006 of about 600.000 euros for research in Surface Plasmon Resonance biosensing. In Year 2012 a Japanese National Research Grant (Kaken) equivalent to 42.000 Euros for research in the field of LED emission and characterization.