［様式－学 5］

Abstract of Doctoral Thesis

Development of New Deep Ultra Violet Light Emitting/Sensing Devices using Nitride Semiconductor Metal Organic Chemical Vapor Epitaxy

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Deep Ultra Violet Light (hereafter DUV)　(200-350nm) is useful for applications of DUV curing, photo synthesizing, disinfection of virus/phages and so on.　So far, Hg lamps have been used for those purposes.　However, after the establishment of the Minamata Convention on Mercury on 2013, use of Hg lamps is basically prohibited. So, the replacement of Hg lamps to other DUV light sources is required.　Nowadays, DUV LED are considered to be the replacement of the Hg lamps, but the high price of the LED and the difficulty to emit strong DUV light shorter than 260nm makes the replacement difficult.

In this research micro-plasma excited DUV light emitter (hereafter MIPE) has been newly developed which has good properties of Hg free, large area emission, high power and shorter wavelength operation. In this device the luminescent targets are excited efficiently by dynamically controlled plasma.　 In the experiments, 6cm×5cm large scale MIPE with emission power of about 200mW was realized under the wavelength less than 260nm.

For real application of the DUV light, development of cheap and high power LED is necessary as well.　For that purpose development of vertical type LED but not horizontal LED is required.　 In this research a new technique to flow current through insulating AlN buffer layer was developed by introducing spontaneous via holes in the insulating layer for the first time around the world.　 By using this technique current can flow directly from p-electrode to n^{+}Si substrate.　 The device produced using this technique does not require any substrate removal processes and resist processes and make possible to develop cheap and high power DUV LED.

In addition to this development of DUV LED using via holes formation technique the DUV light sensor on Si substrate is also successfully realized.　By integrating this sensor and Si devices on the Si chip, and making sensor array, and combining with MIPE, it becomes possible to disinfect virus/ phages efficiently and to decompose materials. These devices open a window to develop new application in DUV region.