$$E(x)=E_{GaN}-x(E_{GaN}-E_{InN})-bx(1-x), \quad (1)$$

where the band gaps of GaN and InN are E_{GaN} = 3.4 eV and E_{InN} = 0.7 eV, respectively. The x and b are represented the indium content and bowing parameter of 1.4 eV, respectively [17]. The indium contents of A_0, A_{500}, A_{600}, A_{700} and A_{800} were estimated as 32%, 33%, 34%, 37% and 39%, respectively. The indium contents determined from μ-PL measurements are very close to those from XRD results shown in Fig. 4(a). Moreover, it proves again that the indium content is increased by raising the annealing temperature.

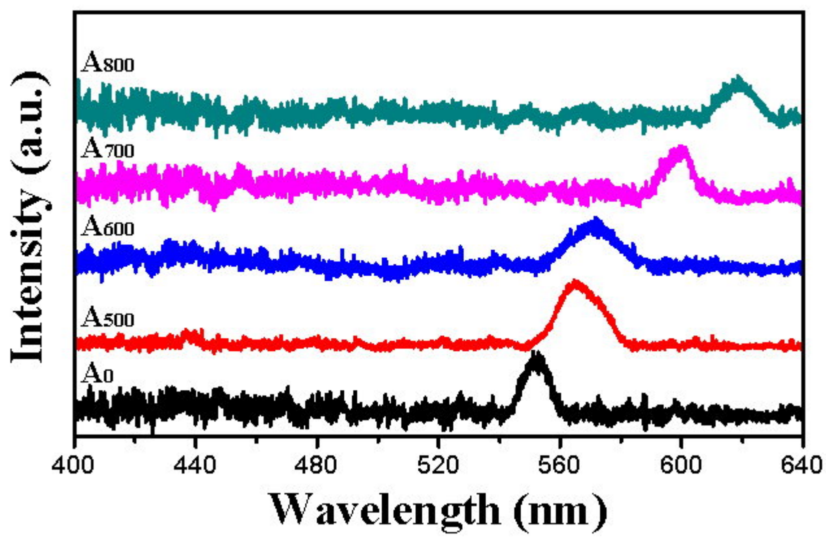

Fig. 5. μ-PL spectra of A_0 and A_{500}-A_{800} etched in HCl solution.

4. Conclusion

InGaN films with indium contents of 33% and 60% were prepared on the MOCVD-grown undoped GaN templates by pulsed laser deposition at 300 °C. Then the films were annealed by using the non-vacuum furnace to investigate the effect of annealing temperature on crystal structure, indium content and emission characterization of InGaN. Because of the In_2O_3 formation on surface during the non-vacuum furnace annealing, it resulted in the blocking of indium out-diffusion from InGaN. Therefore, the indium content of InGaN layer can be increased efficiently. The luminescent property of InGaN measured by micro-photoluminescence indicated the emission peak was shifted to long wavelength with an increment of annealing temperature, corresponding to the trend of increased indium content. This indicates the InGaN films can be potentially useful in optoelectronic devices.

Acknowledgments

This research was supported by National Science Council (Taiwan, R.O.C.) under the Contract Nos.101-3113-E-005-002-CC2 and 101-2221-E-005-023-MY3.

#183851 - $15.00 USD Received 22 Jan 2013; revised 8 Mar 2013; accepted 10 Mar 2013; published 15 Mar 2013

(C) 2013OSA