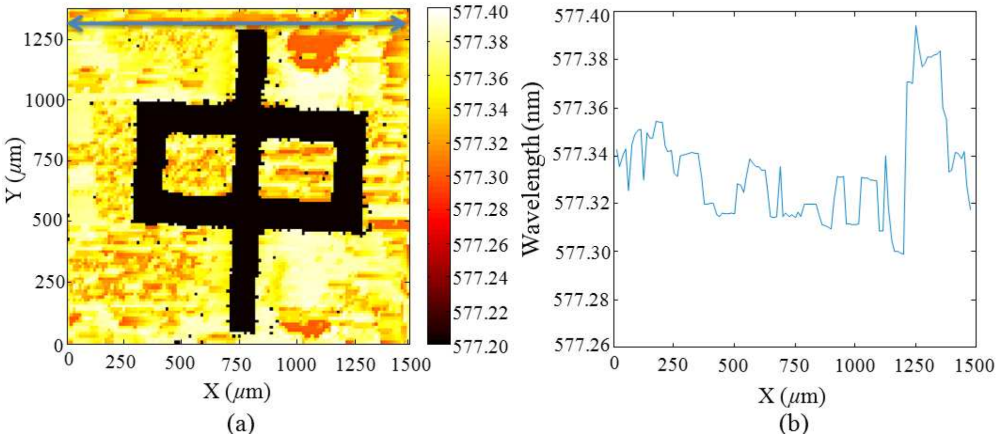

Fig. 7. Emission characteristics of a patterned DFB laser. (a) The stimulated emission image of a patterned DFB laser: The black part with a pattern "中" indicates the dumb region where the gain layer has been removed. So the laser does not lase there, while the laser works normally in the complementary region. The spatial resolution of the image is 12.5µm, and the feature size of the pattern is 125 µm. (b) The spatial distribution of the stimulated emission wavelength cross a horizontal line in (a): The variation of the lasing emission cross the horizontal line is within a 0.14 nm range, while the lasing wavelength difference between adjacent spots is less than 0.01 nm.

5. Conclusion

A fabrication method that combines nanoreplica molding and horizontal dipping processes has been developed for organic DFB lasers upon flexible plastic substrates. The spatially corrugated surface can be produced inexpensively and in virtually any periodicity upon a plastic substrate by the nano-replica molding method. The subsequent horizontal dipping process allows uniform coating of dye doped polymer active layer onto the grating surface at desired thickness ranging from 234.0 nm to 3.1 µm. Lasing from the polymer-based DFB structure, having a replicated $\Lambda = 400$ nm polymer grating and a Rhodamine 590 doped SU-8 active medium, has been demonstrated and characterized. The laser emission wavelength can be controlled in the λ = 564.82-600.33nm wavelength range. The tested DFB laser exhibits a linewidth of $\Delta\lambda = 0.15$ nm, a threshold pump fluence ~0.169 mJ-cm^{-2} at $\lambda = 532.00$ nm, and emission wavelength variations as small as 3.15 nm over a 10 cm^2 area. From this example of a plastic DFB laser, it is clear that the developed fabrication method has the capability of producing organic DFB laser and organic DFB laser arrays for a wide range of wavelengths.

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