URN etd-0407109-183720-1685
Author Shao-Hui Kang
Author's Email Address No Public.
Statistics This thesis had been viewed 62 times. Download 28 times.
Department
Year 2006
Semester 2
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title Fabrication of butterfly-scale photonic quasi-structure and its optical application by using soft lithography technology
Date of Defense 0000-00-00
Page Count 72

Keyword
PDMS
PCS

Abstract
ABSTRACT
There are structure of beautiful color and optics characteristic on butterfly's wings, its iridescence effect and special optics nature, attract the research focus of the photoelectric field at present. This research utilizes soft lithography, is it print off iridescence effect, butterfly of wing to transfer to, use among making technology (Ploydimethylsiloxane, PDMS) , transfer to print off the complicated scale structure to organize, utilize PDMS transfer to print off and cover the scale structure on the butterfly wing to organize, use the scanning electron microscope (SEM)、atomic force microscope (AFM) enlarge and observe the slight structure on the scale, receive true Morpho matrix structure and is distributed in the range, enlarge the size organizing in the matrix structure at the same time, it is analysed that PDMS soft lithography technology is being transfered to the characteristic which is printing the micro-structure.
The experiment is by analyzing the high resolution of optics microscope and UV/ VIS analysis (Argyreus hyperbius)、(Papilio bianor thrasymedes)、(Prioneris thestylis formosana)、(Morpho aurora aureola) Optics on the butterfly wing surface is reflected,Transmittance and absorbed the characteristic.The experimental result shows, Morpho butterfly's wing micro-structure forms the reflecting rate higher than the reflecting rate of other butterflies, so regard Morpho butterfly as and transfer to the micro-structure of printing, is observed by SEM and transfered to the vein micro-structure printed, demonstrate the same array scale as Morpho butterfly and carinate fin slice, small in more quantity than Morpho butterfly in the slight branch form structure, but metal micro-structure of color and luster printed off to transfer to raise reflect, it is it print off by AFM array carinate fin of alternate size nearly the width of 1.5μm to transfer to measure.Upset of 0 to 75 degrees of Morpho micro-structure, analyse different optics of angle change, Morpho printed off to transfer to is it greater than from 0 to 45°corner 90% high person who reflect but 60 produce scattering phenomenon to 75°reflect to demonstrate.Experimental analysis butterfly wing fluorescence in the scale, because include the small structure photonic crystal slab (PCS) similar to the photonic crystal in the scale on the butterfly wing, Fluorescence in the organization, cause scale form phenomenon of groove to similar to LED on PCS layer. The Fluorescence range released is in 527, 528, 532nm separately, the wavelength is the highest in the intensity of 528nm, and firefly's light wave lands on the green spectrum range long. fabricate the high light LED , can be similar to the mirco-structure PCS of the photon crystal, high light LED formed from the scale.
The experiment, in order to transfer to the micro-structure of printing in a large amount, utilize

transfered to technology leave pattern on PDMS, in the polymer membrane with wet etching (IsoamyI Acetate) .Is it print micro-structure etch micro-structure height their that happen layout 3.5 μm in 150-240nm to transfer to in a large amount, utilize and etch two times to transfer wetly to technology of printing, but a large amount of models the small and complicated three-dimensional structure. The experiment is utilized and etched wetly second and transfered to technology of printing, it is it print way can a large amount of model small and complicated three-dimensional structure to transfer to, can apply to imitative and biological structure and optics nature in the future. The experiment is utilized and etched wetly second and transfered to technology of printing, it is it print way can a large amount of model small and complicated three-dimensional structure to transfer to, can apply to imitative and biological structure and optics nature in the future.The photon crystal structure that is transfered to printed off on the butterfly wing the experiment is with the argon (488-514 nm) Laser to excite photon crystal periodic array structure, is it produce electrons, electric holes of freedom to excite photon, and then change some refraction rate and mere transmission characteristic, reach the result which is similar to LED display of the high strength.Soft lithography and micro-etching technology , applies to and fabricate photon crystal structure, optics component or the anti-counterfeit to distinguish etc.
Key word :Soft lithography, iridescence effect, photon and crystal, PDMS, PCS
Advisory Committee Tzu-Yao Tai - advisor

Files etd-0407109-183720-1685-001.pdf

indicate access worldwide
Date of Submission 2007-07-24