

Fabrication of Cr nanoring arrays by nanosphere lithography for light extraction

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Abstract

Functional nanorings with optical and magnetic properties have attracted intensive attentions. This study aims to develop a low cost process for the fabrication of Cr nanoring arrays to improve light extraction. The Cr nanoring arrays in long-ranged hexagonal order with controllable period can be obtained by nanosphere assembly, followed by plasma etching, Cr coating and lift off processes. The effects of coating and reactive ion etching process on the size and shape of Cr nanorings were investigated. The results show that the mean values of lateral size and height of nanorings are in the range of 147.1~196.4 nm and 7.8~40.8 nm respectively. The statistical analysis shows that lateral size distribution of the Cr nanorings varied with different deposition times. In order to verify the optical effect, a 100 nm Alq3 thin film was deposited onto the nanoring arrays by thermal evaporation, and pumped the Alq3 layer with 405 nm blue laser. The phenomenon of this nano-optics gave rise to a selective spectral response and a 32.6 % extraction enhancement was observed compared to a flat substrate.

Keyword : Nanoring arrays, Nanosphere lithography, Spin-coating, Reactive ion etching