Wavelength coded volume holographic gratings based fluorescence imaging system

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1. Introduction

Different wavelength fluorescence images can provide specific information of the biological samples. Here, we introduce a wavelength coded volume holographic gratings (VHGs) based fluorescence imaging system [1], the VHGs can function like the beam splitting optical component to image two different color fluorescence images. In order to improve the optical sectioning ability of the system, the study combines the HiLo imaging process with the system [2]. The system setup and experiment results are discussed thoroughly.

2. Experimental setup and results

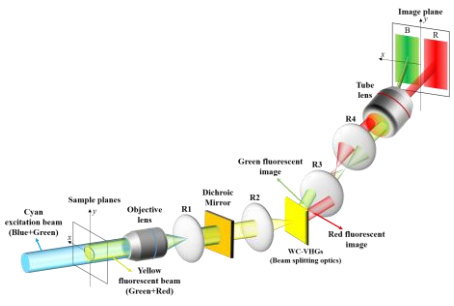

Fig. 1

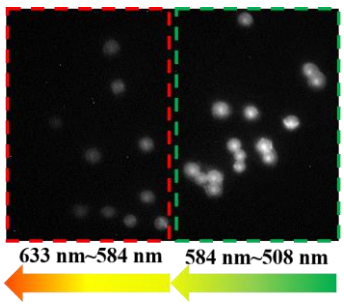

Fig. 2

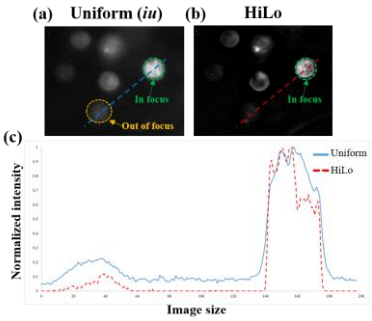

Fig. 3

The high Bragg selective VHGs consists of two gratings designed for the wavelength 633 nm and 532 nm respectively [1]. Figure 1 depicts the proposed imaging system, the setup utilizes the cyan laser to illuminate the fluorescence sample to excite different wavelength images. A dichroic mirror is placed to reject the stray cyan excitation light. Under the Bragg matched condition, the VHGs can make the green and red fluorescent images project to the different lateral location on to the CCD. The experimental results show a pair wavelength images of the fluorescent beads with diameter 45.0μm to verify the system can image the green and red fluorescent images as shown in Figure 2. Next, the study combines the HiLo imaging process with the system [2]. It requires a uniform and a speckle-illumination image to obtain the full spatial frequency range image as shown in Figure 3 (a) and (b). Figure 3 (c) shows the HiLo image can reduce the defocus signal.

3. Conclusion

In summary, we propose a wavelength coded VHGs based fluorescence imaging system that can provide a pair wavelength fluorescence images and optical sectioning images.

4. References

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[2] D. Lim, T. N. Ford, K. K. Chu, and J. Mertz, “Optically sectioned in vivo imaging with speckle illumination HiLo microscopy,” J. Biomed. Opt. 16(1), 016014 (2011).