

光学设计

基于荧光显微镜单色光源系统的椭球反射镜的设计

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摘要 为了实现胞内钙离子浓度的检测, 设计了一种新型的荧光显微镜单色光源系统。系统采用短弧氙灯作为发光源, 利用椭球面反射镜聚焦后得到模拟的点光源, 经过准直及闪耀光栅分光、汇聚后, 耦合到光纤中形成单色光输出。在荧光显微镜照明激发系统中, 单色光源的输出功率和光谱纯度是仪器的2个技术关键, 其中非球面反射镜是设计的重点。通过优化算法和光学仿真模拟, 对系统的光能效率进行了分析和计算, 设计了用于单色光源系统的椭球面反射镜, 并研制成整套系统。经实验验证, 效果良好。

关键词 [椭球面反射镜](#) [单色光源](#) [优化算法](#) [光学设计](#)

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Design of elliptical reflector based on fluorescence microscope monochromatic source

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Abstract In order to detect $[Ca^{2+}]_i$, a novel monochromatic source for the fluorescent microscope was designed. The system uses a short-arc Xenon lamp as light source. All the light is converged to a point source by the elliptical mirror. The point source is coupled into an optical fiber to form the monochromatic light output after collimating, light splitting and focusing by the blazed grating. In the illumination and excitation system of the fluorescence microscope, the light power and spectral purity of a monochromatic source are the two technical essentials, in which the aspherical reflector is the priority in design. The energy efficiency of the whole system was analyzed and calculated according to the optimization algorithm and the optical simulation. The elliptical reflector for the monochromatic source system was designed, and the complete equipment was developed. The experiment result shows that the elliptical mirror works in the whole system perfectly.

Key words [elliptical reflector](#) [monochromatic source](#) [optimization algorithm](#) [optical design](#)

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