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光电工程

基于双旋延迟器结构的偏振BRDF测量系统的设计

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摘要 偏振双向反射分布函数（BRDF）不仅可以表示物体散射光辐强度的空间分布情况，还包含了丰富的偏振信息。与标量BRDF相比，偏振BRDF可以更加精确地、全面地表示物体表面的光散射情况。设计了基于双旋延迟器结构的偏振BRDF测量系统，通过同步旋转波片调制入射光和散射光的偏振态，得到一系列变化的光强值，再由光强的Fourier分解系数计算获得样品的偏振BRDF值。系统内设计了一对正交反射镜，用以减小系统中器件后向散射光的影响。通过铝板偏振BRDF的测量，说明了该系统具有较高的准确性。

关键词 光散射 偏振双向反射分布函数 米勒矩阵 双旋延迟器结构 傅里叶分解

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Design of polarimetric BRDF measurement system based on configuration of dual rotation retarder

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Abstract Polarization BRDF can be used to describe the space distribution of radiation intensity of objects and it includes plenty of polarization information. Compared with the scalar BRDF, the polarimetric BRDF can show the light scattering of an object surface more accurately and completely. A polarimetric BRDF measurement system based on dual rotating retarder configuration was designed. The polarization state of incident and scattering light was modulated by synchronously rotating wave plates to acquire a series of changing light intensity. The polarimetric BRDF of the sample was obtained by calculating the Fourier decomposition coefficients of the light intensity. A pair of orthogonal mirrors were mounted in the system to minimize the influence of back-scattering light from some other components in the system. The precision of measurement system was demonstrated by the measurement result of the aluminium-plate polarimetric BRDF.

Key words scattering light polarization BRDF Mueller matrix configuration of dual retarder Fourier decomposition

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