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可变温条件下材料表面的双向反射分布函数测量

戴景民[1],赵忠义[1],李颖[2]

1.哈尔滨工业大学电气工程及自动化控制学院, 黑龙江哈尔滨150001; 2.哈尔滨工业大学能源科学与工程学院, 黑龙江哈尔滨150001

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摘要 基于双向反射分布函数单一参考测量法的测量原理，研制了一套测量温度最高可达500℃的双向反射分布函数测量系统。系统利用转角装置来实现不同角度位置的变换，用加热炉对试样进行加热，采用模糊PID控制器进行温度的控制。在25℃～500℃的温度范围内，对铜表面的双向反射分布函数进行了测量实验，光源采用可见光波长0.6328μm，功率约8mW的He-Ne激光器，选用Si1336-5BK光电探测器。实验表明：随着试样表面温度的升高，铜表面的BRDF测量值发生了改变；在温度上升或下降到同一温度时，铜表面的BRDF测量值不同。最后，对实验现象的形成机理进行了深入分析。上述实验结论对材料表面空间反射特性的研究具有重要意义。

关键词 双向反射分布函数 材料表面温度 探测器

分类号 0552.5

BRDF measurement of material surface at variable temperatures

DAI Jing-min[1],ZHAO Zhong-yi[1],LI Ying[2]

1. School of Electrical Engineering & Automation, Harbin Institute of Technology, Harbin 150001, China; 2. School of Energy Science & Engineering, Harbin Institute of Technology, Harbin 150001, China

Abstract A measurement system of bidirectional reflectance distribution function (BRDF) was developed based on the BRDF measurement principle of single reference measurement method, and it works at up to 500℃. Different angle position transfer was realized by a turntable device. The sample was heated by a furnace and the temperature was controlled by a fuzzy PID controller. The BRDF on a Cu surface was measured at the temperature of 25℃～500℃ by using a He-Ne laser as the light source whose wavelength was 0.6328μm and power was 8 mW. The Si1336-5BK photoelectric detector was selected for the measurement. The experiment shows that the measured value of BRDF on the Cu surface changes when the temperature on the sample surface is rising, and the BRDF value on the Cu surface is different when it increases or decreases to the same temperature. The forming mechanism of the phenomenon was analyzed. The conclusions can be used for further study on spatial reflectance characteristics of material surfaces.

Key words BRDF temperature of material surface detector

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通讯作者 赵忠义 zhongyizhao@hit.edu.cn