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激光与光电子技术应用

基于红外双光路的薄膜在线测厚系统的研究

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摘要： 红外测厚是薄膜在线测厚的主要方法之一，为了解决传统的红外测厚方法中尚存在的易受光源稳定性的影响、不适用于高速薄膜生产线等缺点，采用双光路参比测量的方法设计了一种双光路红外测厚系统，系统将光源的光分成测量路和参考路两路，并使用单个CCD同时收集两路光作为光强传感器。描述了系统的成像原理，讨论了系统对朗伯定律的适用性，最后通过对聚乙烯和聚四氟乙烯薄膜的标定实验论证了系统的精度。结果表明，该方法精度高、鲁棒性好，且能够有效避免光源不稳定带来的影响。

关键词： 测量与计量 薄膜测厚 红外 双光路

Research of on-line film thickness measurement system based on infrared dual-light path

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Abstract: Infrared thickness measurement is one of the main methods of online film thickness measurement, but traditional infrared thickness measurement method still has such defects that it is sensitive to the stability of light source and it is not applicable to high-speed film production line. In order to solve these problems, a dual-light path reference measurement method was used and a dual-light path infrared thickness measurement system was presented. In the system, the light source is divided into measurement light path and reference light path, using a single CCD connecting both the measurement light and the reference light as light intensity sensor. The imaging principle was described and the applicability of the system for Lambert law was discussed. Finally, calibration experiments for polyethylene and polytetrafluoroethylene film were conducted to demonstrate the accuracy. The experimental results show that the method has high precision and good robustness, and can effectively avoid the impact of the unstable of light source.

Keywords: measurement and metrology film thickness measurement infrared dual-light path

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