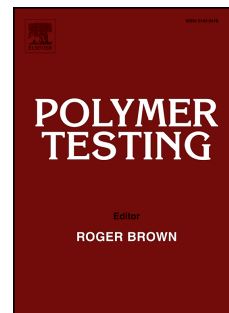


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Test Method

A novel imaging-enhancement-based inspection method for transparent aesthetic defects in a polymeric polarizer

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Abstract: The transparent aesthetic defects of polymeric polarizers are difficult to image and characterize using conventional illumination. To inspect such special defects, an automated inspection method was studied that employs the structured lighting technique to markedly enhance defect imaging. The defect was modelled as a microscale plano-convex lens, which has a slight difference in refractive index within its normal region. The imaging enhancement mechanism of the defect was simulated with a model in which the binary stripe patterns of the structured-light source are equivalent to a one-dimensional diaphragm. The experimental results were in agreement with the simulation, suggesting that the model and mechanism are feasible. A novel spatial texture filtering algorithm with higher speed and higher accuracy is proposed to process the structured light images. Approximately 200 samples with defects were successfully imaged, processed and characterized. This inspection method was verified by the final experimental results and has potential for real-time and in situ testing of defects in other polymer films and products.

Keywords: Machine vision; Defect inspection; Structured-light illumination; Imaging enhancement mechanism; Polymeric polarizer.

1. Introduction

A polymeric polarizer is one of three key components of thin-film transistor (TFT) liquid crystal display (LCD) panels. Generally, a polarizer typically is comprised of six transparent layers of polymeric film. Each layer is tens of micrometers thick. For a polymeric polarizer, imperfections in the materials and failure during manufacturing will produce aesthetic defects that are observable to end users; such defects are aesthetically displeasing, can occur at any layer of the polarizer, but do not present any functional disadvantages. A basic classification of the various types of aesthetic defect includes impurities, stains, scratches, dents and bubbles; a more complex

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