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A STUDY ON ALGORITHM FOR AUTOMATED FABRICATION OF REFLECTOR PORTS IN WAVELENGTH DIVISION MULTIPLEXING (WDM) DEVICES

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Abstract

Wavelength Division Multiplexing (WDM) modules are key components in optical communication systems for transmitting and separating multiple optical wavelengths. This study presents the development of a high-precision alignment and bonding system and a vision inspection algorithm for automating the fabrication process of reflector and pass ports in WDM modules. The proposed system employs point bonding and rotational bonding processes to achieve precise assembly of filter chips and G-lenses. In addition, image processing techniques based on a Sobel filter, high-pass filtering, and second-derivative analysis are applied to accurately detect epoxy dispensing boundaries and shapes. Automated measurement algorithms for reflector-port dispensing width and pass-port dispensing length are also implemented to improve inspection reliability. Experimental results demonstrate that the proposed method reduces the effects of illumination variation and noise while enhancing edge detection performance, thereby contributing to improved quality consistency and productivity in WDM module manufacturing processes.

Keywords:
Wavelength Division Multiplexing (WDM), Optical Communication Module, Vision Inspection, Image Processing, Alignment Bonding, Automation