

Surface crack detection with low-cost photoacoustic imaging system

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Abstrak

Photoacoustic measurement in an imaging system is a unique method as it uses optical disturbance but observes its effect acoustically. Acoustical observation increases the quality of a measurement by reducing the scattering effect that often occurs in optical research. However, a few problems, such as cost and complexity, hinder development of a photoacoustic system. This report presents a design of a photoacoustic system using a laser diode and a commercial microphone as the acoustic emission source and sensor, respectively. Analysis of the photoacoustic signal received by the microphone was performed with software-based Fourier transformation, which makes the photoacoustic system simpler and lower in cost. By measuring the amplitude of the signal, the system accurately detects surface micrometer cracks. The report shows that the system is capable of producing a photoacoustic image of an object with micro-cracks on its surface. The results indicate that the photoacoustic imaging system developed in the experiment is a more promising way to generate images of cracks than optical imaging