# Improving defect detection capability of pulse and pulse phase thermography method for CFRP plates by enhancing rear surface heat transfer coefficient

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Infrared pulse thermography (PT) is a noncontact and convenient nondestructive inspection method, and its application to various objects has been reported in many papers. However, conventional PT is not suitable for detecting deep- or near-rear-surface defects. This study focuses on PT inspections of CFRP plates and improvements in their defect detection capabilities. To improve the capability of detecting near-rear-surface defects, a method for enhancing the heat transfer coefficient (HTC) of the rear surface during PT inspection was examined in this study; this would increase the temperature difference between the defective and non-defective areas observed in thermal images. To investigate the effectiveness of the proposed method, experiments were conducted on CFRP specimens with artificial defects (flat-bottomed holes). The CFRP specimens were inspected using the PT method, during which water was brought into contact with the rear surfaces of the specimens to enhance the HTC. The experimental results showed that the capability of detecting near-rear-surface defects particularly improved when the rear surfaces were in contact with water with forced convection. In addition, obtaining phase images by applying a Fourier transform to the experimentally obtained temperature data (that is, pulse phase thermography: PPT) was examined. Consequently, the combination of the enhancement of the rear-surface HTC and the use of phase images was significantly effective in improving the defect detection capability.