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The Applied Study of Non-Destructive Test of Using an Infrared Thermography

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In this study, a study was carried out on technology of detecting defects to develop standard measurement technology for composite materials and nuclear pipe power plant by using infrared thermography technique for non destructive tests of composite materials and nuclear power plant pipe, which are widely used all over industries at present. The methods of detecting composite material defects by using infrared thermography are largely divided into passive methods and active methods, and unlike passive ones, the active measurement methods measure the defect size by taking a particular source of stimuli as its harmonic function, delivering it to objects and processing the response signals of objects. The defect detection basic experiment was conducted on artificial defect specimen manufactured with a pipe and composite of materials by using a nondestructive testing technique using infrared and lock-in technologies out of the active methods. To increase the defect detection rate, the related experiment used the lock-in method.
The SCC specimens used for this experiment were designed under PWSCC occurrence conditions provided by using actual pressure and temperature and strong chemical solutions inside the pipe. The pipe used for this experiment was made of such materials as a carbon steel, SA106 B Gr. And a stainless steel, STS 304.
This study was conducted to investigate the detection of SCC micro-cracks in the dissimilar weld metal used for nuclear power plant pipes by using ultrasound infrared thermography.
When carrying out PT (penetration testing) after rupturing materials when hot spots appeared in the rear and outside of a pipe through lock-in ultrasound infrared thermography, this study found out that cracks actually existed with large defects.
By considering the characteristics of composite materials, Cycom 5276-1 G40-800-24K, SK Chemical UGN 150 was selected for CFRP and GFRP. Moreover, according to the characteristics and defect forms of CFRP and GFRP materials, defects of delamination and inclusion were produced out of all the defects possibly occurring in composite materials.
As for the experimental variables, this experiment was conducted on the basis of different heating time of optic source by separating the high frequency from the lowest one likely to be detected according to the kind and thickness of each composite material. Besides, the experiment led to the quantification of defects by using the spatial resolution and lock-in phase values.
When the source of light was shot, CFRP was found to have a higher thermal penetration rate according to the thermal diffusion. On the contrary, GFRP was found to have a lower thermal penetration rate according to the thermal diffusion, compared to CFRP.

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