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Evaluation of Bond Strength with Opto-Acoustic Method TAKUMI KAMIMURA, Southeastern Louisiana University, TOMOHIRO SASAKI, Niigata University, SANICHIRO YIOSHIDA, Southeastern Louisiana University -An attempt has been made to evaluate the bond strength of ultrasonically welded joints with an opto-acoustic method. One end of the specimen (1 cm x 10 cm rectangle with 1 mm thick where the middle of the 10 cm length is lap-welded) is oscillated with an acoustic transducer (1 - 20 kHz), and the harmonic response of the specimen is detected with a Michelson interferometer. One of the 1-cm ends of the specimen is driven by the acoustic transducer (input end) and the other surface on the other 1-cm end (output end) is configured as one of the end-mirrors of the interferometer. A regular mirror is used for the other end mirror. A photodiode is placed behind the beam splitter to detect the change in the relative optical-path length of the interferometric arms due to the acoustic oscillation. The signal from the photodiode is analyzed in the frequency domain to evaluate the input-end to output-end displacement transfer function. It is expected that the bond strength can be differentiated in resonant behavior of the specimen; a weaker bond shows a lower resonant frequency than the stronger bond in the applied frequency range. Our preliminary study with the use of a capacitive displacement sensor, in place of the optical interferometer, indicates the feasibility of this method.

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