

## **FATIGUE DAMAGE EVALUATION OF RAILWAY CARBODY STRUCTURE USING HIGH ENERGY SYNCHROTRON RADIATION**

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The railway carbody structure for commuter and suburban services in Japan is often made of austenitic stainless steel, which is used in the form of thin metal sheets manufactured by cold rolling. Laser welding at lapped joints is used in the construction of such carbodies, but it is difficult to observe the strain distribution around these weld zones, which represent the critical area of the body structure's fatigue strength. The objective of this study is to ascertain the strain and stress distribution in the stainless steel around the weld zone of the carbody structure. To enable observation of this distribution, a strain scanning method using high-energy synchrotron radiation in SPring-8 was applied to the strain measurement of austenitic stainless steel. The transmission and reflection method was applied in order to observe the internal weld zone. Using this method, we can measure the strain distribution from the surface to the inside of the weld zone. A lapped joint specimen, prepared by welding 2mm- thick plates using the laser welding method, was used for measurement. Austenitic stainless steel generally poses problems in the measurement of strain due to its coarse grain and crystal texture. The gage volume in this measurement had a width of 2 mm and a height of 0.15 mm. The measurement provides the strain distribution of both residual strain and strain under loading, and the results obtained successfully show the distribution of strain in the weld zone. The differing tendency between the distribution of residual strain and that of strain under loading is clarified. In addition, the specimen after fatigue test was measured. The results of specimens before and after fatigue test were compared. The full width at half maximum (FWHM) value shows a difference between the tendency of the measured value of the weld zone and that of the base material.