Name	Job Title	Area of Expertise
KOYAMA Atsuhiro	Associate Professor	Strength and Fracture of Materials, Fatigue

1. Main Research Topics

In order to prevent global warming, there are many things that must be done to reduce the weight and improve the efficiency of mechanical structures. To reduce the weight of mechanical structures, it is necessary to fully understand the strength properties of the mechanical structural materials and ensure the safety and long-term reliability of structures that use these materials. Therefore, we are conducting experimental research to understand the strength properties, especially the fatigue strength properties, of various mechanical structural materials.

① **Evaluation of fatigue characteristics of structural materials**

We investigate the fatigue properties of materials such as steel and aluminum alloys, as well as the fatigue properties of materials that have been joined by dissimilar metal bonding, welding, adhesives, etc. Furthermore, we obtain the fatigue strength properties not only in air at room temperature, but also in water. We obtain the S-N curves (Fig. 1) and fatigue crack growth behavior, providing basic data for reliability design.

② **Development and application of laser and electron beam induced acoustic microscope**

Micro-defects on the surface of a material or inside the material near the surface are one of the factors that have a significant effect on the fatigue strength of the material. In this research, we are developing the microscope system for non-destructive observation of micro-defects (micro-cracks, voids, etc.) near the surface of a sample using the laser or electron beam. (Figs. 2 and 3 are examples of images observed using the electron beam induced acoustic microscope.)

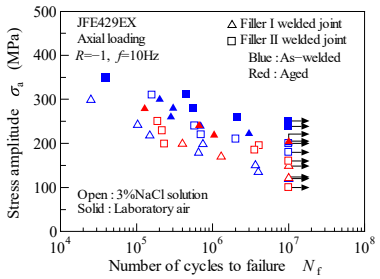

Fig.1 Comparison of fatigue strength characteristics of MIG-welded stainless steel in air and in 3% NaCl solution (*S-N* curves).

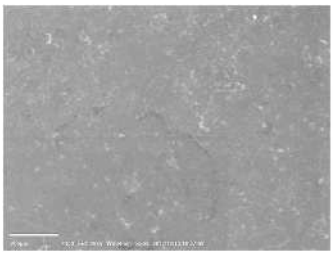

Fig.2 Surface observation of Aluminum alloy with 0.2 mm diameter hole inside.

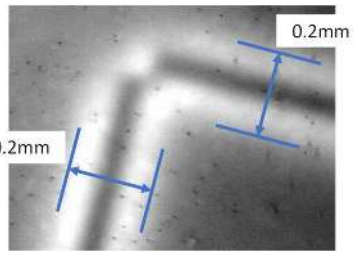

Fig.3 Image of internal hole observed using the electron beam induced acoustic microscope.

2. Keywords

Fatigue life, Fatigue crack growth behavior, SLAM, SEAM

3. Remarks and Websites

We can perform tensile and fatigue tests and provide highly accurate data.
In addition, because SLAM and SEAM can detect very small defects of about a few μm in size, we believe they can be applied to the inspection and quality assurance of semiconductors and MEMS materials.

If you provide us with test materials or observation samples, we will evaluate the material properties and provide you with the results.

researchmap: https://researchmap.jp/read0068615
Laboratory: