

# Science of “Joining”: Joining metals and testing its strength

Various metal materials are widely used in practical applications around us. **Joining technology** is essential to bring out the full potential of these materials in the products. In this training, we will investigate **how the materials are joined**, and **how the strength of the joint changes** through joining process such as arc welding, ultrasonic welding, and friction stir welding. Let's have discussions based on the experimental results to make a stronger joint than that before joining.

## Welding and Joining

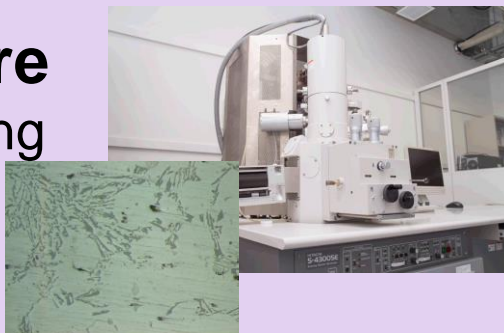
Ultrasonic Welding

Friction Stir Welding



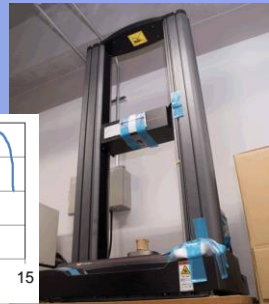
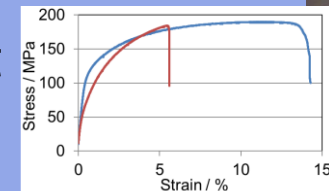
## Microstructure

Cutting / Polishing  
Observation by  
microscope



## Mechanical property

Tensile test  
Hardness test



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