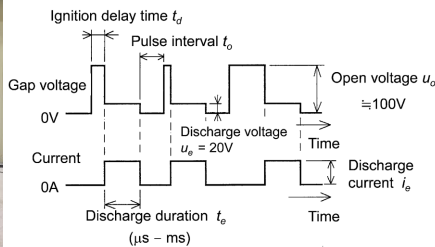


Repeat WEDM to Reduce the Effect of the Recast Layer and Reduce the Surface Roughness

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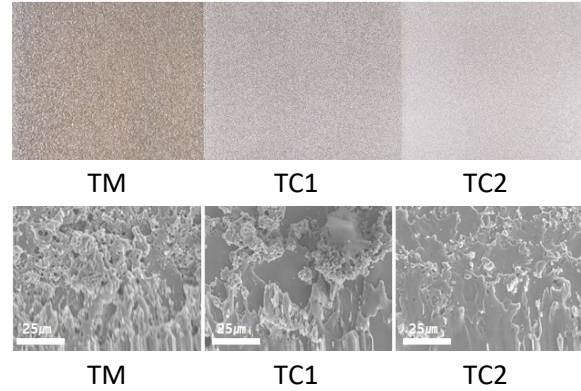
Introduction

Sample processing for the mechanical properties of irradiated samples must be dimensionally accurate and not damage the material. It also requires radiation protection for the test space and the researcher. Considering this, a CNC wire electric discharge machining (WEDM) machine is used. However, sample processing through WEDM forms an arc and forms a thin layer on the sample surface. It consists of a recast oxide layer (WL) and a heat affected zone (HAZ). This layer has high hardness and acts as a crack initiation point when evaluating mechanical properties, and the thickness of the layer is controlled by EDM conditions.



Results

1. Image of WEDM machined specimen



2. Wire-EDM machining

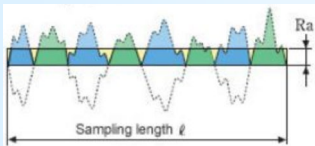
	TM	TC1	TC2	as-received
Hardness(HV)	300.3	250.2	186.6	164.4
Oxide(at%)	18.4	7.63	5.45	1.3
Roughness(µm)	3.509	1.505	0.544	0.853

Experiment

1. Wire-EDM machining

	Gap voltage	Servo voltage	On time	Off time
MC	6	38	15	8
TC1	13	43	2	11
TC2	9	40	2	10

2. Surface roughness analysis



$$Ra = \frac{1}{l} \int_0^l |Z(x)| dx$$

- 3D profile was measured by Keyence VHX-6000 microscopy
- Image of the surface was analyzed using SEM

3. Oxidation analysis

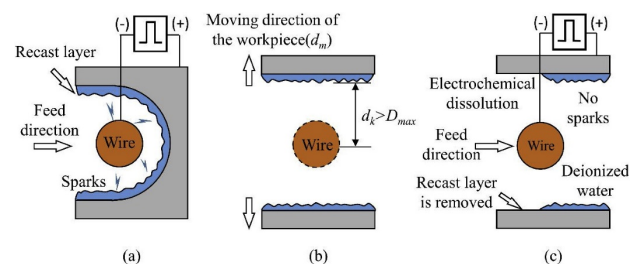
- Surface oxidation is analyzed through SEM-EDS.

4. Hardness measurement

- Mechanical property of WL and HAZ layer effects are analyzed by Vickers Hardness test.

Discussion

- As the sample treatment was repeated, the roughness and oxidation degree of the sample surface improved.



- Surface hardness is reduced by improving roughness and oxidation.

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