

# Application News

Material Testing System

No.265

## Compression Test on Brake Friction Materials by Shimadzu MCT-W500 Micro Compression Testing Machine

Friction brakes mounted on automobiles, for example, are indispensable for ensuring safety. Friction brakes operate by using the friction between two solid objects to create braking action. R&D, for example, into modification of raw materials is being conducted to improve braking performance.

As an evaluation method for viewing the properties of brake friction materials, the following introduces an example of a compression test performed using a flat indenter to measure the relationship between force and displacement.

### 1. Specimen

Defective and non-defective materials were prepared as evaluation subjects.

1) Specimen name	Brake friction material	
	Non-defective part	Defective part
2) Specimen thickness	0.5 mm	0.5 mm

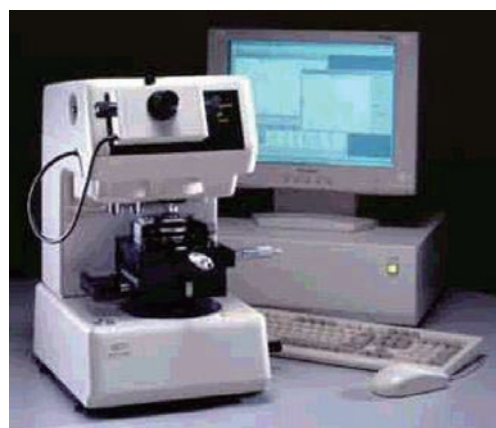


Fig. 1 Overview of MCT-W

### 2. Test conditions

Test conditions were as follows.

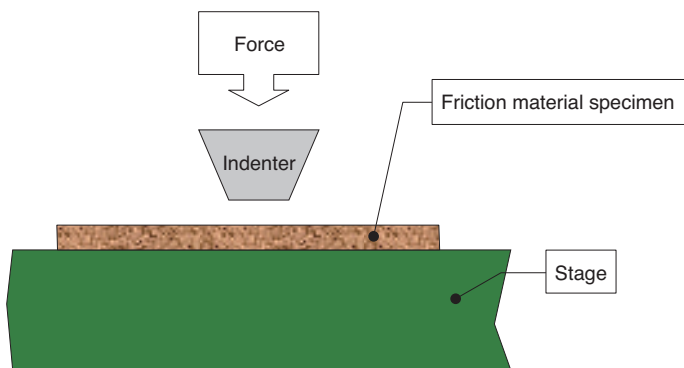
1) Testing machine	Shimadzu MCT-W500 Micro Compression Testing Machine (See Fig. 1.)
2) Test type	Compression test
3) Test force (mN)	4903
4) Loading rate (mN/sec)	207.411
5) Upper indenter	500 $\mu$ m dia. flat indenter (made of diamond)
6) Test method	<p>The compression test was performed directly on the friction material using a 500 <math>\mu</math>m dia. flat indenter.</p> 

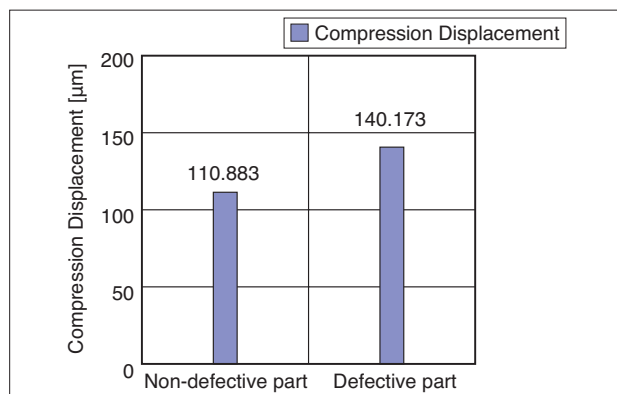
Fig. 2 Conceptual diagram

### 3. Test results

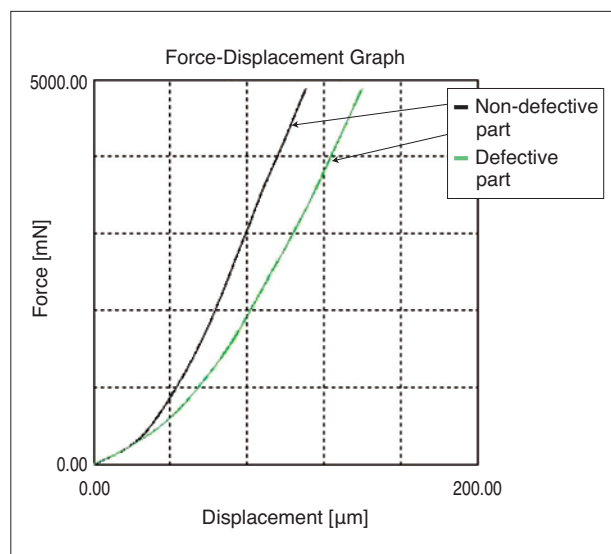
- 1) Table 1 and Fig. 3 show the results of performing the compression test under the test conditions in section 2, and Fig. 4 shows the "force-displacement graph" obtained by the test.

**Table 1 Compression Test Results Using MCT-W500**

Specimen Name		Force	Compression Displacement
		[mN]	[ $\mu\text{m}$ ]
Friction Material	Non-defective part	4893.2	110.883
	Defective part	4891.9	140.137



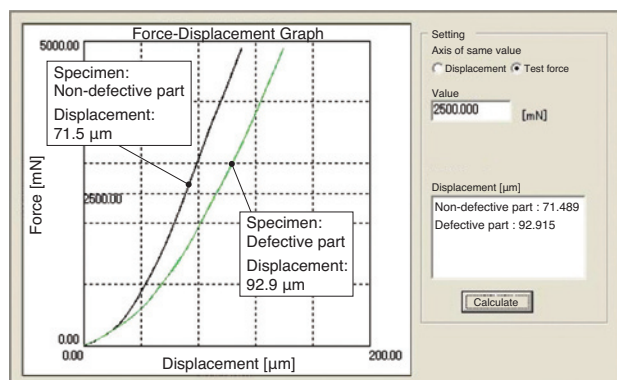
**Fig. 3 Relationship Between Sample Name and Compression Displacement**



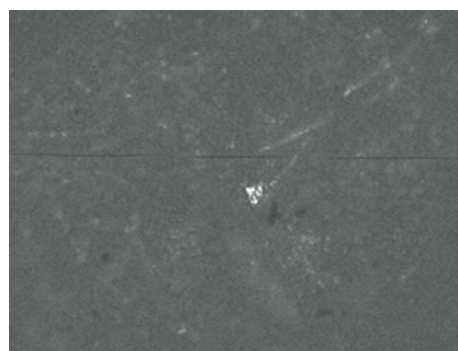
**Fig. 4 Force-Displacement Graph**

Table 1 and Fig. 3 reveal that defective parts are softer and have a larger displacement than non-defective parts.

- 2) From the "data under same value (force-displacement graph)" obtained by the test, the displacement values of the non-defective and defective parts at a force of 2500 mN are found to be 71.5  $\mu\text{m}$  and 92.9  $\mu\text{m}$ , respectively.



**Fig. 5 Data under Same Value (Force-Displacement Graph)**



**Fig. 6 Specimen No. 1**

- 3) Fig. 6 shows the picture of non-defective specimen after compression test.

### 4. Summary

As shown in this example, the Shimadzu MCT-W500 Micro Compression Testing Machine can obtain high-precision micro compression test property data since it is capable of accurate displacement measurement free of displacement error caused by deflection of the

jig, force detector or other items.

It might also be applicable to evaluating the physical properties of a variety of specimens, in particular, small specimens.



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