

Industrial Consultancy & Sponsored Research (IC&SR)

PREPARATION OF A DOG-BONE SHAPED MICRO-SPECIMEN FOR TESTING OF MECHANICAL PROPERTIES

IITM Technology Available for Licensing

Problem Statement

- The standard test procedure involves subjecting specimens to tension until they fail, with a specified grip separation.
- Elevated or reduced temperature testing is conducted using a thermal chamber integrated with the universal test machine, allowing controlled temperature environments.
- **The thermal chamber uses electric heaters for elevated temperatures and external carbon dioxide gas for reduced temperatures, but it has limitations on maximum elongation.**
- Specimens used in the procedure can be die-cut, machined, or molded and are typically dog bone-shaped.

Technology Category/ Market

Category - Materials Testing and Microfabrication

Applications- Microelectromechanical Systems (MEMs)

Industry - Aerospace and Defense, MEMs

Market- Global Microelectromechanical Systems Market is estimated to reach \$48.5 Billion by 2030 at a CAGR of 8.2%.

Technology

The present invention is a technique for preparing small or micro dog-bone specimens for testing tensile properties of small samples.

The technique involves polishing a small strip of material, typically a metal like Al6061-T6, to create two smooth and parallel surfaces.

The strip is then placed between templates, clamped, and manually polished to achieve the dog-bone shape with precise dimensions.

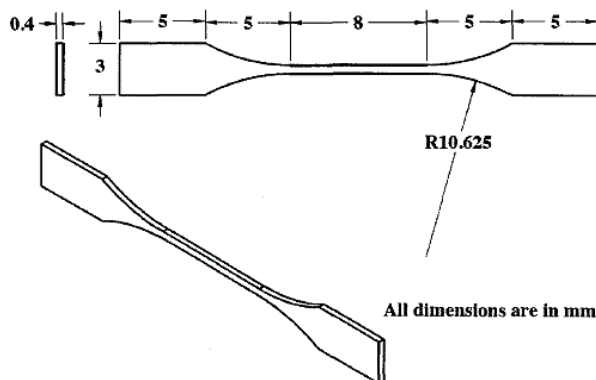


Figure 1. Detailed dimensions of the dog-bone shaped micro-specimen.

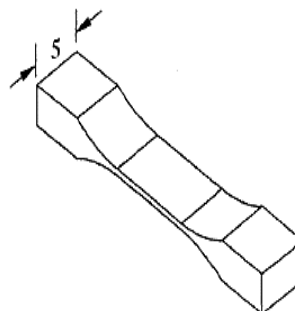


Figure 2. Template for fabricating dog-bone shaped micro-specimens through polishing.

Intellectual Property

- IITM IDF Ref. 1085
- IN 390351 - Patent Granted

TRL (Technology Readiness Level)

TRL - 4, Experimentally validated in lab.

Research Lab

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Key Features / Value Proposition

1. Precision Fabrication:

This method enables the precise fabrication of dog-bone shaped micro-specimens for mechanical testing, ensuring accurate and consistent dimensions.

2. Material Flexibility:

It can be applied to a wide range of metallic and non-metallic materials, offering versatility in testing different materials' mechanical properties.

3. Damage Prevention:

The use of templates with higher rigidity and hardness than the test specimen prevents damage or distortion during the filling and polishing processes.

4. Limited Material Testing:

Ideal for cases with limited material availability, making it valuable for research and applications where material constraints exist.

5. Micro-Scale Testing:

Suited for testing materials at micro-scale dimensions, particularly relevant in applications like MEMs, where traditional testing may not accurately represent material behavior at small scales.

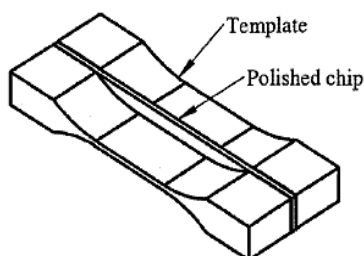


Figure 3. Mounting the polished specimen (chip) between the templates for producing dog-bone shaped micro-specimen through polishing.

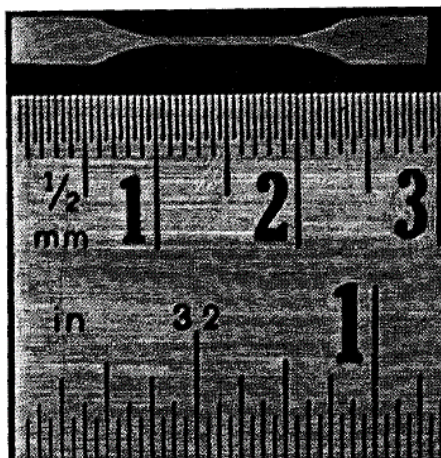


Figure 4. Typical dog-bone shaped micro-specimen fabricated out of aluminum 6061-T6 alloy.

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