



AML Internal Confidential Report: MgB₂ Processing -Graphical Results

Date: August 10th – 13th

Location: NHMFL

ADVANCED MAGNET LAB. INC.

2009

Authored by: Sasha Ishmael

Project Proposal

Measure Performance of Cryogenically Treated Superconductor

AML Proposal#: Q796A

Confidential

1. CUSTOMER

- 1.1. Company **Thermal Technology Services Inc.**
- 1.2. Address: 13130 56th Court, Suite 601 Clearwater, FL 33760
- 1.3. Contact: Frank Masyada; (727)-656-2844

2. PROJECT OVERVIEW

- 2.1. The proprietary technology developed by Thermal Technology Services of Frank Masyada has great potential to improve the mechanical and electrical performance of normal conducting and superconducting materials.
Due to the manufacturing process of superconducting (SC) wire, the crystalline alignment of the SC within the wire remains somewhat randomly oriented after manufacturing. This affects the current carrying capacity along the length of the conductor. A summary of **potential** improvements in superconductors:
 - 2.1.1. Improved crystal alignment, thereby enhancing the current carrying capacity along the length of the conductor.
 - 2.1.2. The enhanced characteristics of the conductor may allow higher operational temperatures, providing a cost savings in the amount of cryogen (e.g. helium) which is used for cooling the application.

3. BACKGROUND

- 3.1. Initial tests were carried out on six (6) samples of MgB₂ superconducting wire
 - 3.1.1. Three (3) processed and three (3) unprocessed.
 - 3.1.2. The test was carried out at a temperature of 4.2 K (liquid helium) in a perpendicular background field which was varied between 8 Tesla and 0.5 Tesla.
 - 3.1.3. The critical current of the samples was measured during these tests.
 - 3.1.4. Two samples "M1" & "M6" showed signs of being degraded (possibly during sample preparation).
 - 3.1.5. Of the three (3) processed samples, one (1) processed sample showed an improvement. The increase in I_c (critical current) observed is ~ 20% (@ 4.2 K).
 - 3.1.6. Since only one sample exhibited an improvement more tests are needed to verify the results.

4. PROPOSED TESTS

- 4.1. AML and TTS have agreed to pursue measurements on additional samples.
- 4.2. Measurements of I_c will be carried out on ~18 - 24 samples of MgB₂ wire
 - 4.2.1. Samples to include cryogenically treated "processed" samples and some control samples which are unprocessed.
 - 4.2.2. The tests will be carried out at a temperature of 4.2 K (liquid helium) in a perpendicular background field, varied between 4.5 Tesla and 0.5 Tesla.
 - 4.2.3. **The critical current of the samples will be measured during these tests.**

5. TEST REQUIREMENTS & RESPONSIBILITIES

- 5.1. Measurement Facility
 - 5.1.1. National High Magnetic Field Lab (NHMFL)
 - 5.1.2. Approximately one (1) week
- 5.2. Liquid Helium (~750 liters)
- 5.3. Background field magnet and data acquisition system (NHMFL)
- 5.4. Samples & Processing (AML & TTS)
- 5.5. Test personnel (AML & NHMFL)
- 5.6. Data analysis (AML)
- 5.7. Testing Report (AML)

6. PRICING

- 6.1. Testing & Analysis not to exceed.....US \$13,144.⁰⁰
 - 6.1.1. AML is providing these services at cost, without G&A or profit.
 - 6.1.2. All prices are subject to change without notice after sixty (60) days from date of quotation.
 - 6.1.3. Pricing includes the scope of work as defined in this proposal.

7. SCHEDULE

- 7.1. 4 weeks – ARO
 - 7.1.1. May vary depending on schedule availability at the NHMFL

8. PAYMET SCHEDULE

- 8.1. 50% - ARO
- 8.2. 50% - Delivery of Report

9. TERMS & CONDITIONS

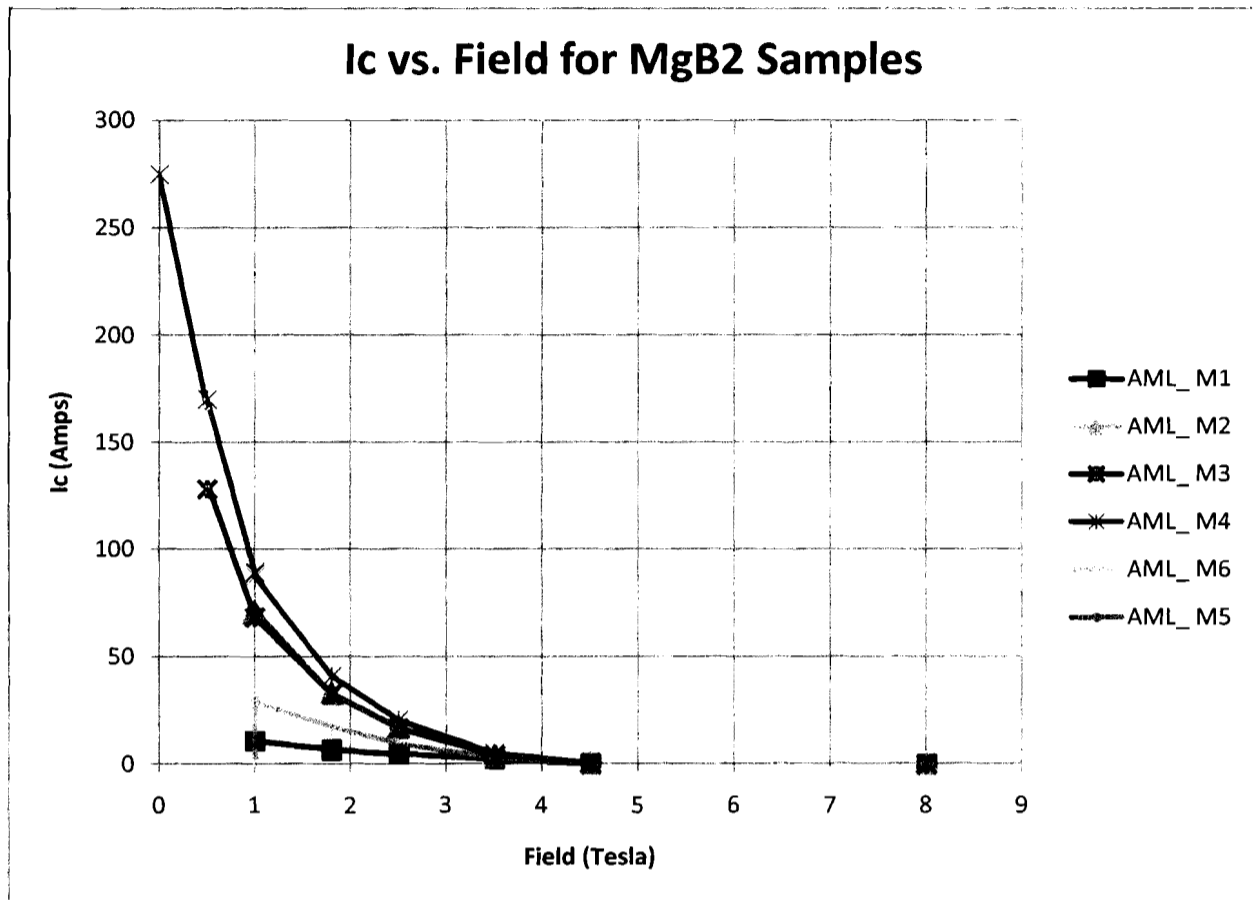
- 9.1. All payments NET 30 DAYS

10. CUSTOMER REQUIREMENTS

- 10.1. Customer to provide their proprietary treatment to the “processed” samples. Samples are provided by AML.

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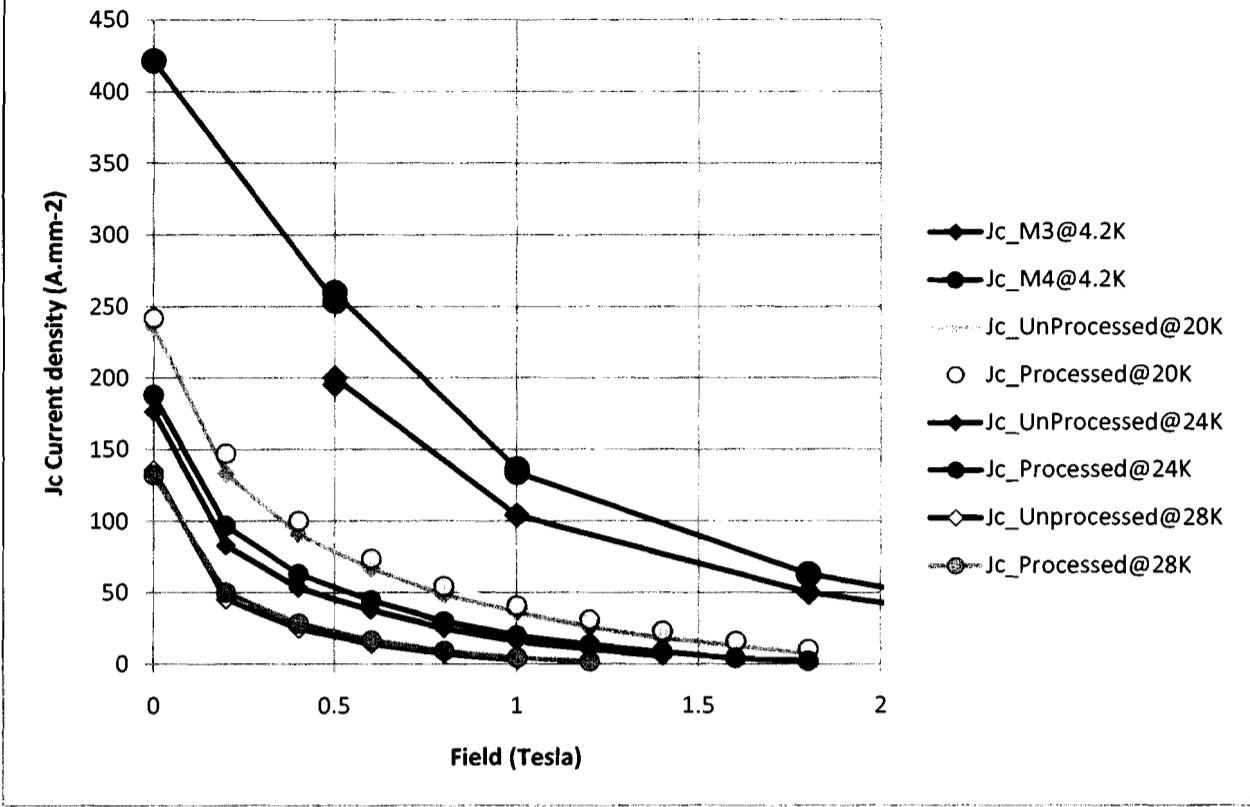
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Comparison of Jc @ Different Temperatures



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