

Neutron Absorber



NRC PUBLIC MEETING WITH
NUCLEAR INDUSTRY VENDERS

Rockville, MD

March 14, 2013

Kazuto Sanada

Nippon Light Metal Company, Ltd., Tokyo, Japan

Nikkeikin Aluminium Core Technology Company, Ltd., Tokyo, Japan

- 1. Corporate Profile**
- 2. What is *MAXUS*[®]**
3. Manufacturing Process
4. Quality Control
5. Testing
6. Application
7. Operating Experience
8. Material Properties

1. Corporate Profile



	Nippon Light Metal Holdings Co., Ltd. ¹	Nikkeikin Aluminium Core Technology Co., Ltd. ²
Headquarters	Tokyo, Japan	Tokyo, Japan
Established	October 1, 2012	October 1, 2002
Capital ³	476 Million US\$ ⁴	5.6 Million US\$ ⁴
Sales ³	4,903 Million US\$ ⁴	393 Million US\$ ⁴
Employees ³	10,041 Persons ⁴	900 Persons ⁴

1) URL: <http://www.nikkeikinholdings.com/>

2) URL: <http://www2.nikkeikin.co.jp/act/>

3) and its Consolidated Subsidiaries

4) in the term ending in March 2012

1. Corporate Profile

Nippon Light Metal Holdings Co., Ltd.

→ Nippon Light Metal Co., Ltd.

Nagoya Plant

Rolling of Al Plate

→ Other Companies

→ Nikkeikin Kakoh Kaihatsu Holdings Co., Ltd.

→ Nikkeikin Aluminium Core Technology Co., Ltd.

→ Nikkei Niigata Co., Ltd.

Niigata Plant

extrusion, Rolling and Others

→ Nikkei Technology Center Co., Ltd.

Osaka Plant

Case Processing

→ Other Companies

→ Other Companies

→ Toyo Aluminium K.K.

Hino Plant

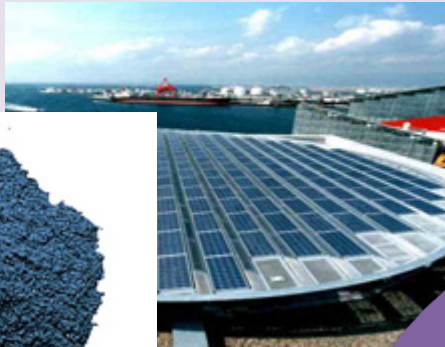
Atomizing, Blending and Others

→ Other Companies

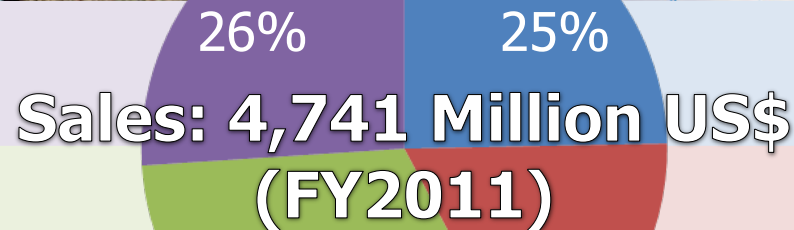
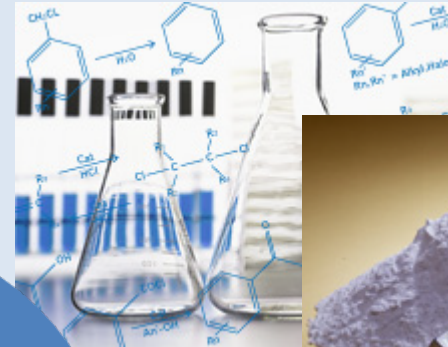
→ Other Companies

1. Corporate Profile

Aluminum Foil, Powder and Paste



Aluminum Ingot and Chemicals



Fabricated Products and Others

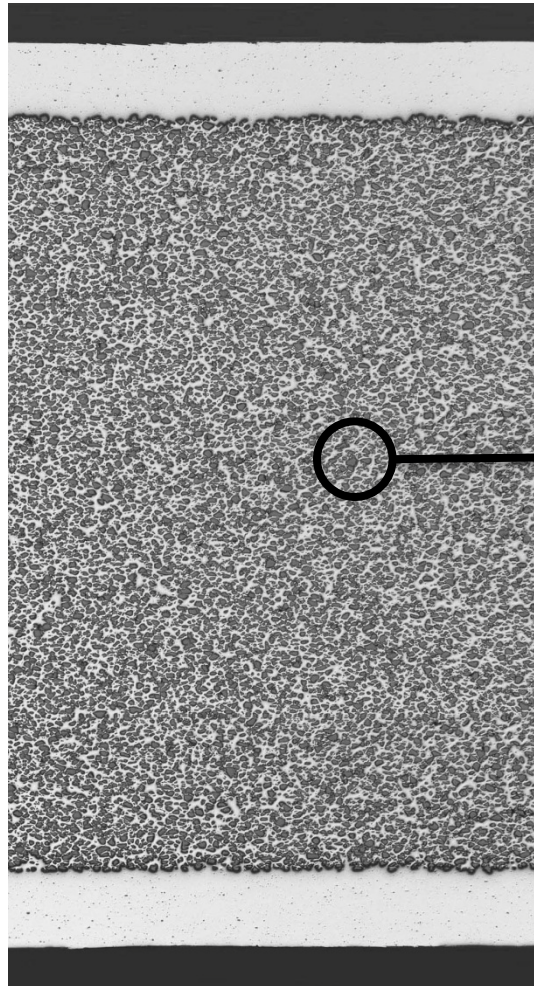
Aluminum Sheet and Extrusions

2. What is **MAXUS**[®]

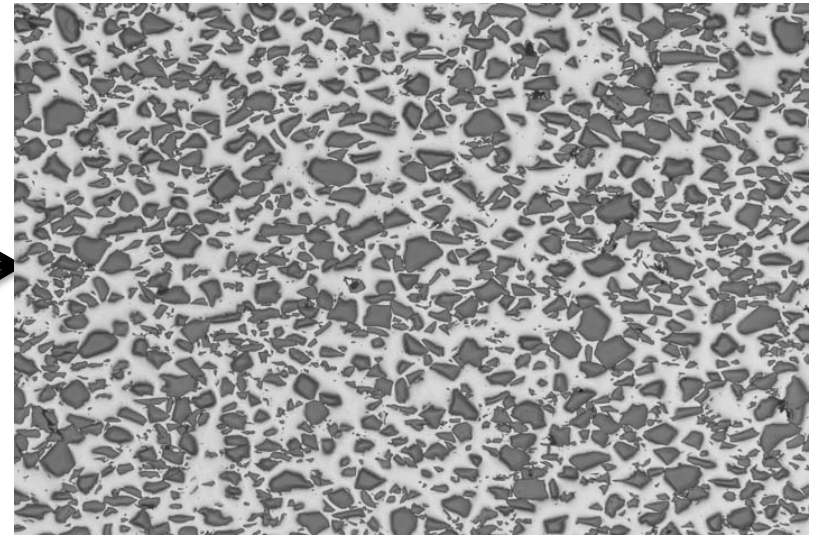


MAXUS is a clad material with high density and is qualified as MMC.

Skin
A5052 (Al-Mg)



Core
A1070+B₄C



← 200μm →

Skin
A5052 (Al-Mg)

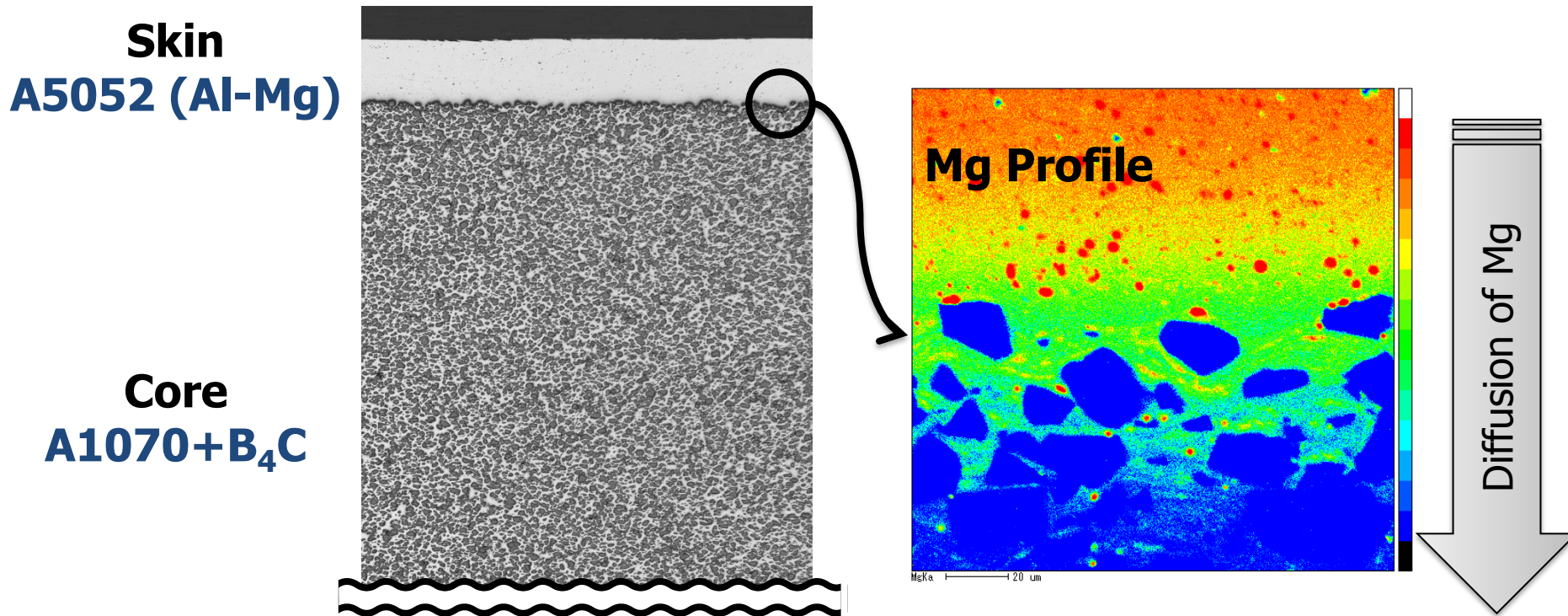
A1070 + 40wt% B₄C

MAXUS is a clad material with high density and is qualified as MMC.

- No B₄C particles loss from the surface because of the clad structure.
- Composed of A1070 and A5052 that have good corrosion resistance.

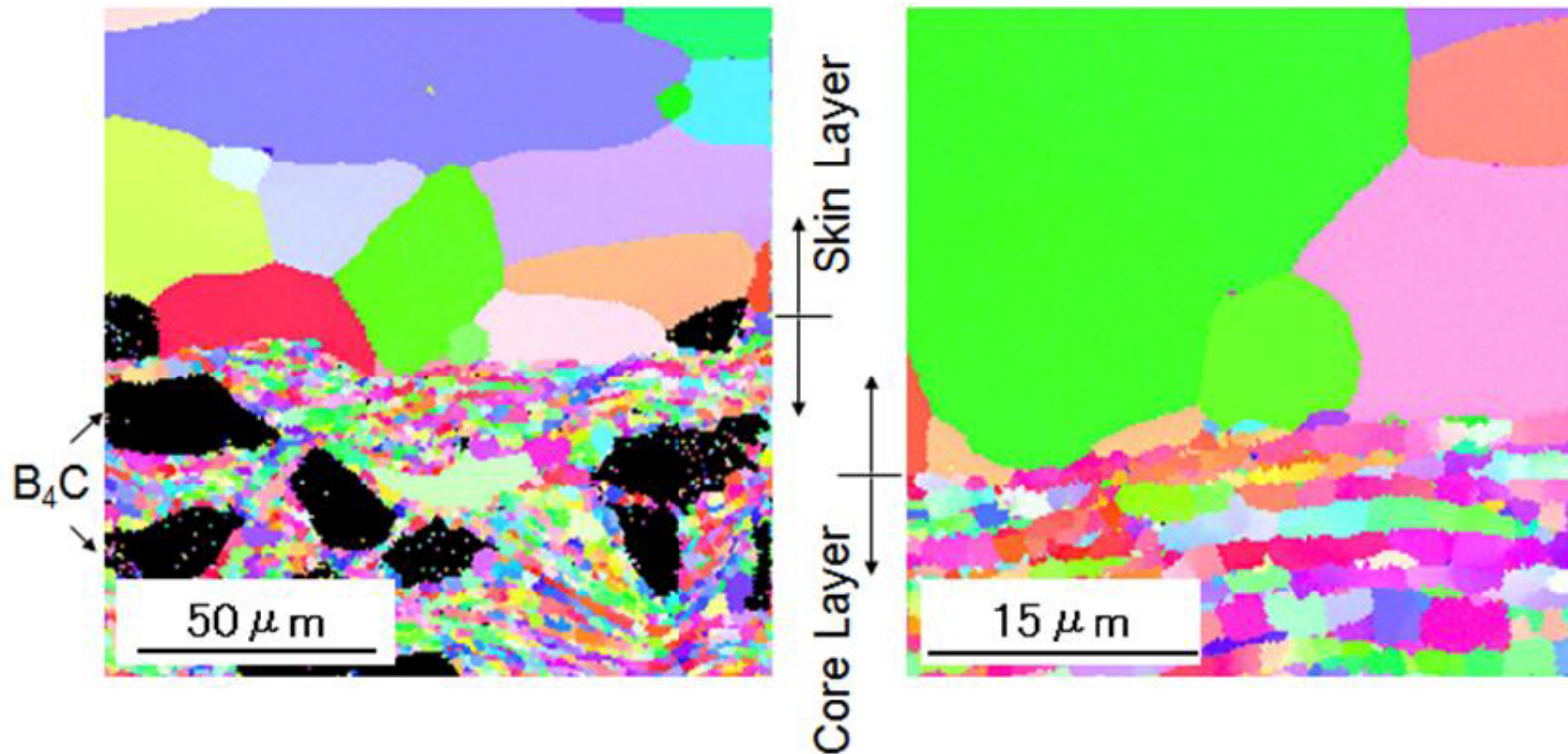
Material	Purity of Al
A1070	≥ 99.70%
A1050	≥ 99.50%
A1100	≥ 99.00%

MAXUS is a clad material with high density and is qualified as MMC.



- Diffusion of Mg from the Skin into the Core Al
⇒ Metallurgical Bond between Core and Face Skins

Grain boundary structure of between skin and core by SEM-EBSD.

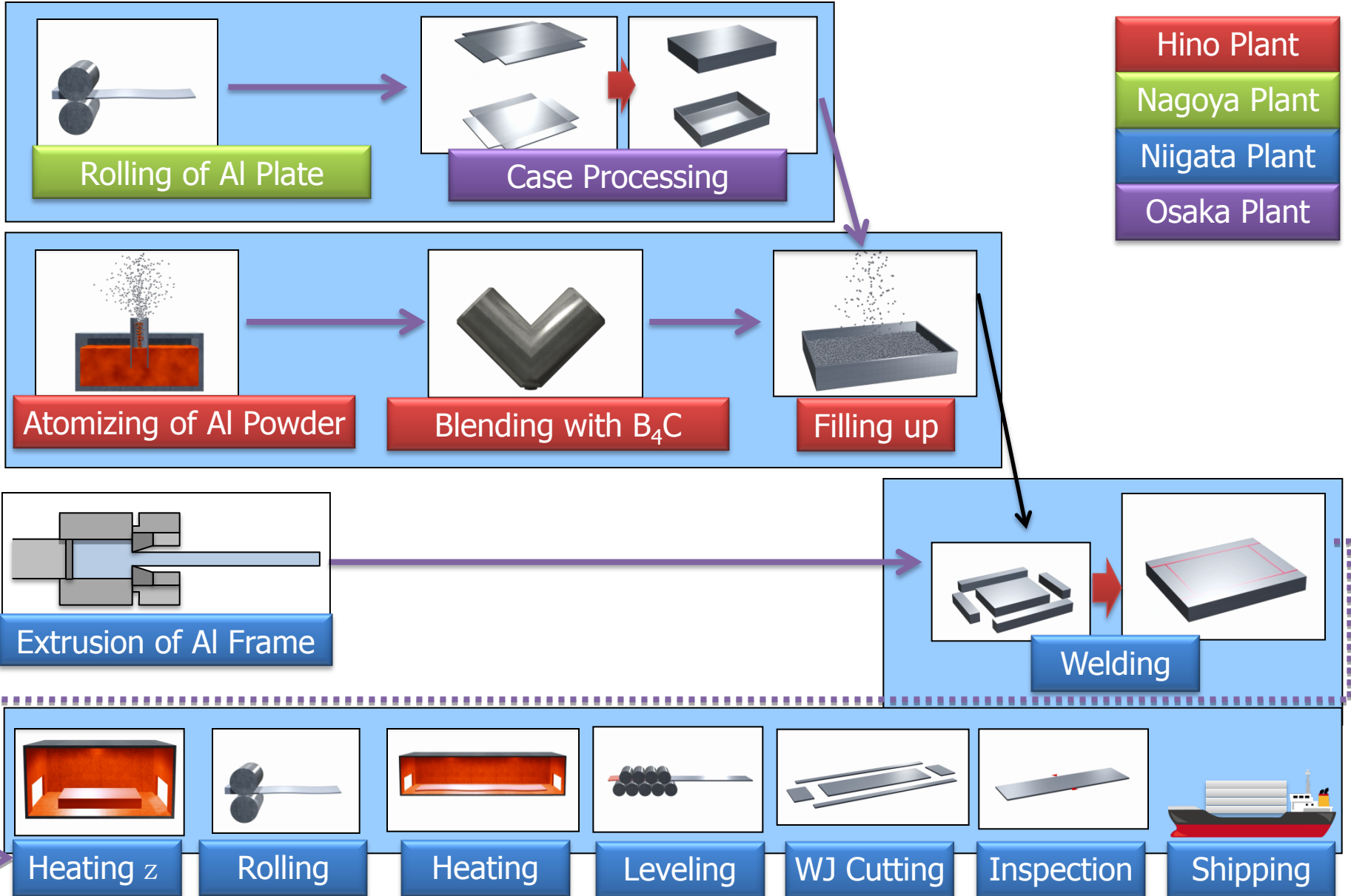


(a) Low magnified image.

(b) High magnified image.

1. Corporate Profile
2. What is *MAXUS*[®]
- 3. Manufacturing Process**
- 4. Quality Control**
- 5. Testing**
- 6. Application**
- 7. Operating Experience**
- 8. Material Properties**

3. Manufacturing Process

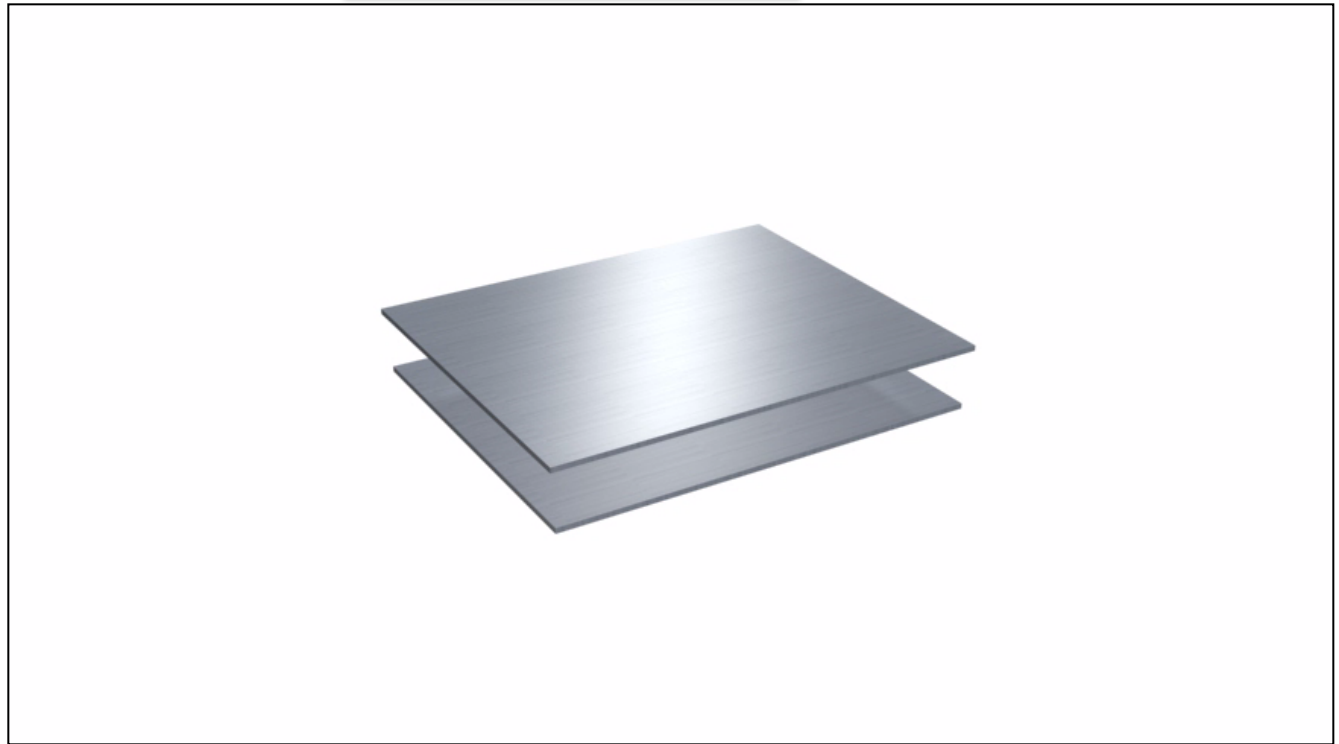
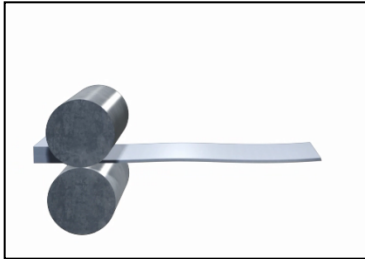


3. Manufacturing Process

Rolling of Al Plate



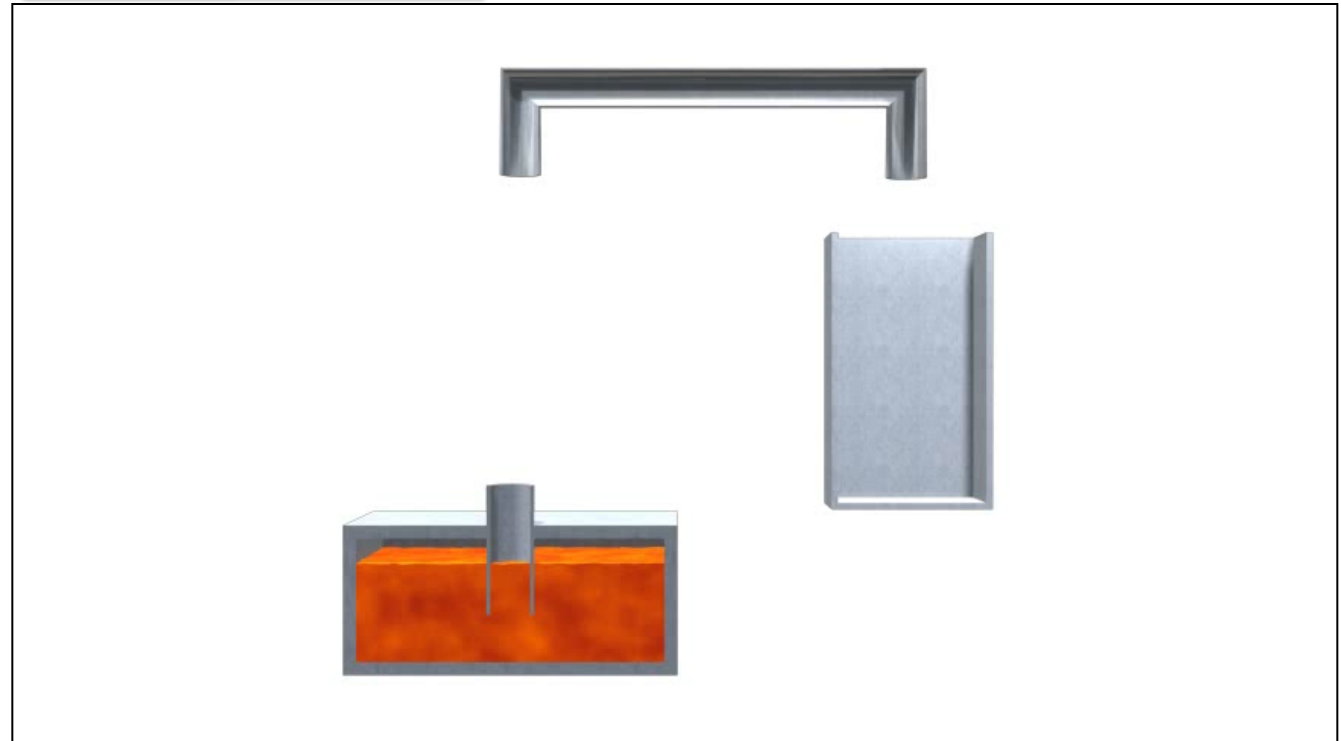
Case Processing



- Hino Plant
- Nagoya Plant
- Niigata Plant
- Osaka Plant

3. Manufacturing Process

Filling up g with B_4C



Hino Plant

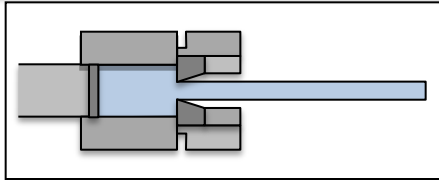
Nagoya Plant

Niigata Plant

Osaka Plant

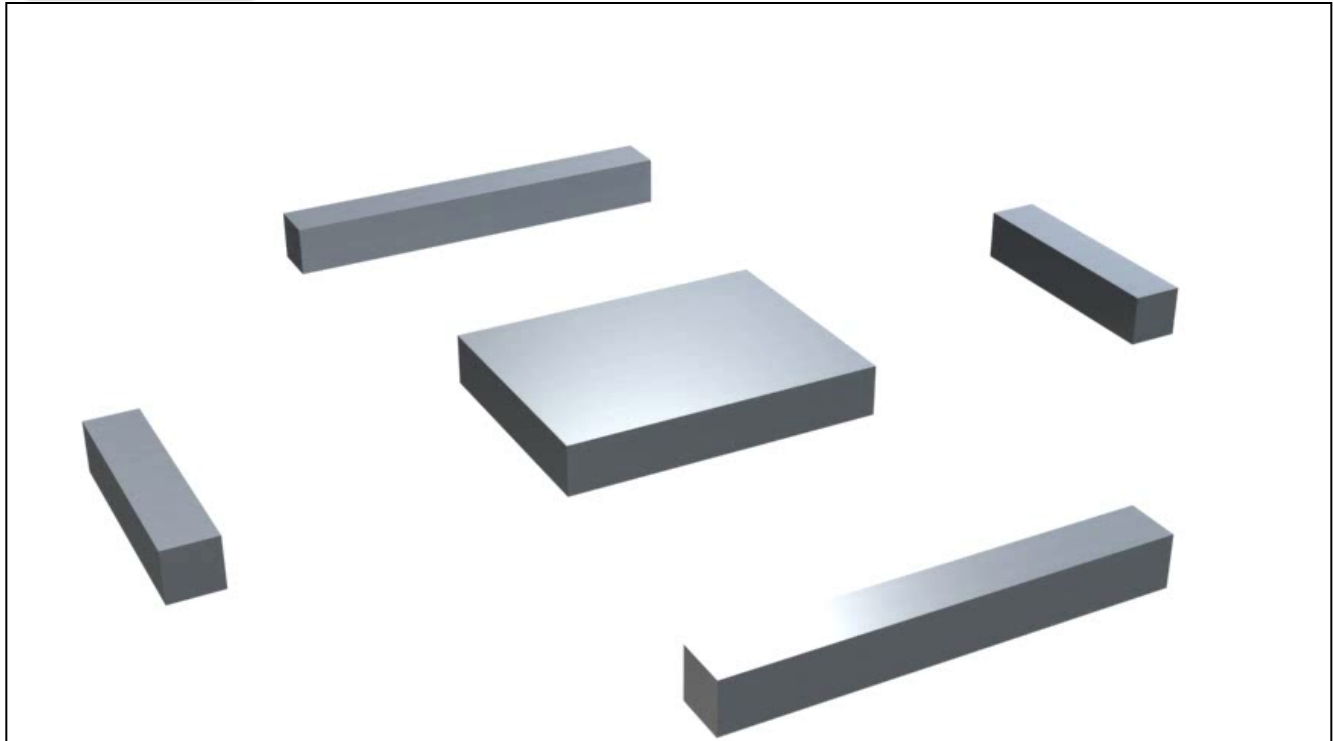
3. Manufacturing Process

Extrusion of Al Frame



Shipping

Welding



- Hino Plant
- Nagoya Plant
- Niigata Plant
- Osaka Plant

3. Manufacturing Process

We control the whole process in-house from the upstream processes (powdering) to the downstream processes (rolling and cutting).

- Hino Plant
- Nagoya Plant
- Plant
- Plant

- We get the MMC grade density by rolling directly from powder.

- We assure the highest quality throughout the manufacturing process.



4. Quality Control

Rules and Regulations		
10 CFR 71 Subpart H	NRC	Compliance
10 CFR 72 Subpart G	NRC	Compliance
10 CFR 830 Subpart A	NRC	Compliance
10 CFR 50 Appendix B	NRC	Compliance
10 CFR 21	NRC	Compliance
NQA-1	ANSI / ASME	Reference
NP-5652	EPRI	Reference
TR-017218-R1	EPRI	Reference
G414 1-3	DOE	Reference

5. Testing

Typical Testing	Notes
Thermal Durability	
Corrosion	From 96 to 8,000 hours
Mechanical	Tensile Test
	Bending Test
Density and Interconnected Porosity	
Boron Uniformity	
Thermal Conductivity	(ASTM E 1225)
¹⁰ B Areal Density Verification	Neutron Transmission
Chemical Composition Analysis	ICP-AES

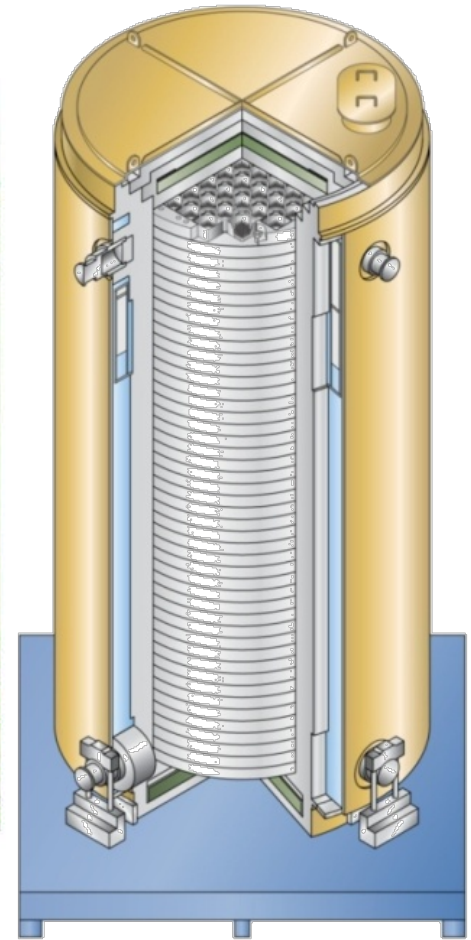
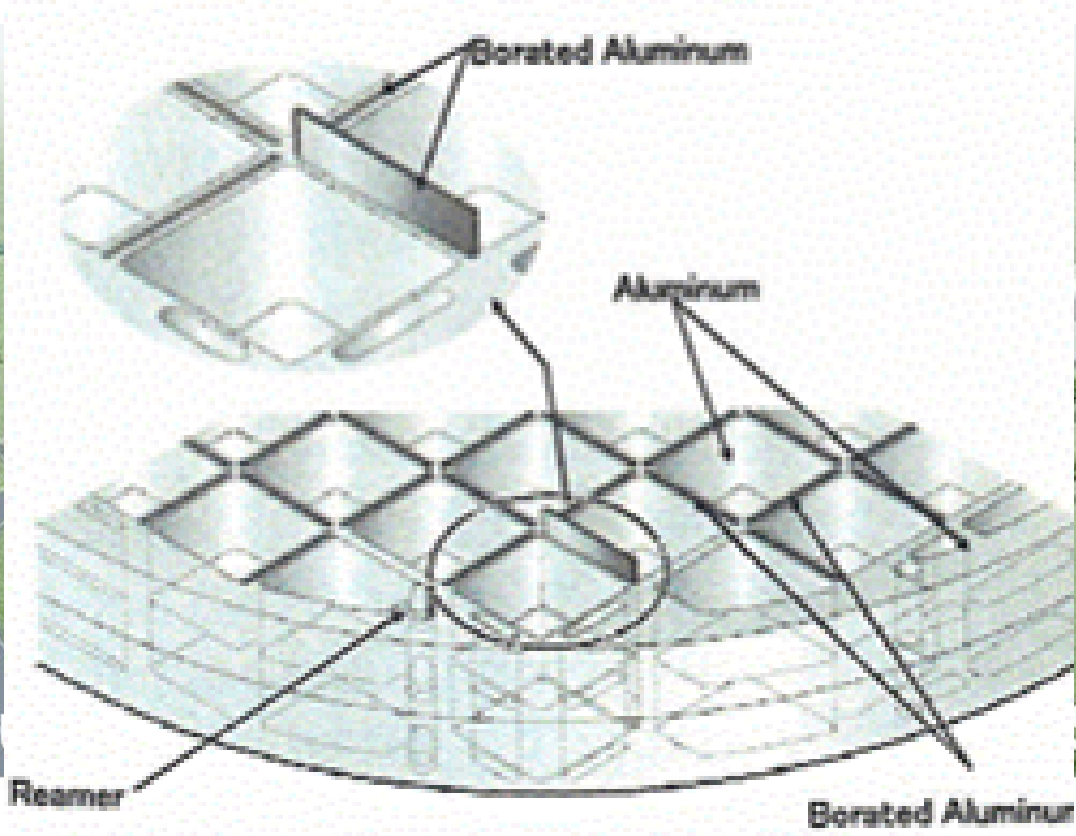
5. Testing - NLM GROUP Testing Laboratory



6. Application

Application		Customer	Status
Neutron Absorber	for Dry Casks	USA	Qualified, Actually In-Use
		JPN	Qualified, Actually In-Use
	for Wet Storage Racks	USA	Qualified
	for a Nuclear Complex	USA	Qualified, Actually In-Use
Neutron Filter	for a Nuclear Complex	JPN	Qualified, Actually In-Use
Structural Material for Dry Casks		JPN	Under Development

6. Application



Neutron Absorber for Japan

6. Application



✓ **Diameter**
660.4 mm (26 inches)

✓ **Wall Thickness**
10 mm (0.4 inch)

✓ **Height**
2146.2 mm (84.5 inches)

Neutron Absorber for Oak Ridge National Laboratory

6. Application



For JRR-3 (Extrusion MMC Tube)



**For JRR-4
(MAXUS with FSW)**

Neutron Filter for Japan Atomic Energy Agency

7. Operating Experience

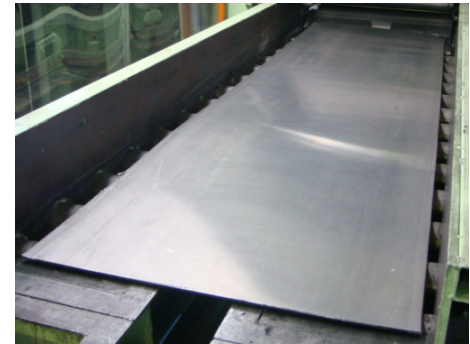


'99 '00 '01 '02 '03 '04 '05 '06 '07 '08 '09 '10 '11 '12 '13

**Powder Product
(not Neutron Absorber)**



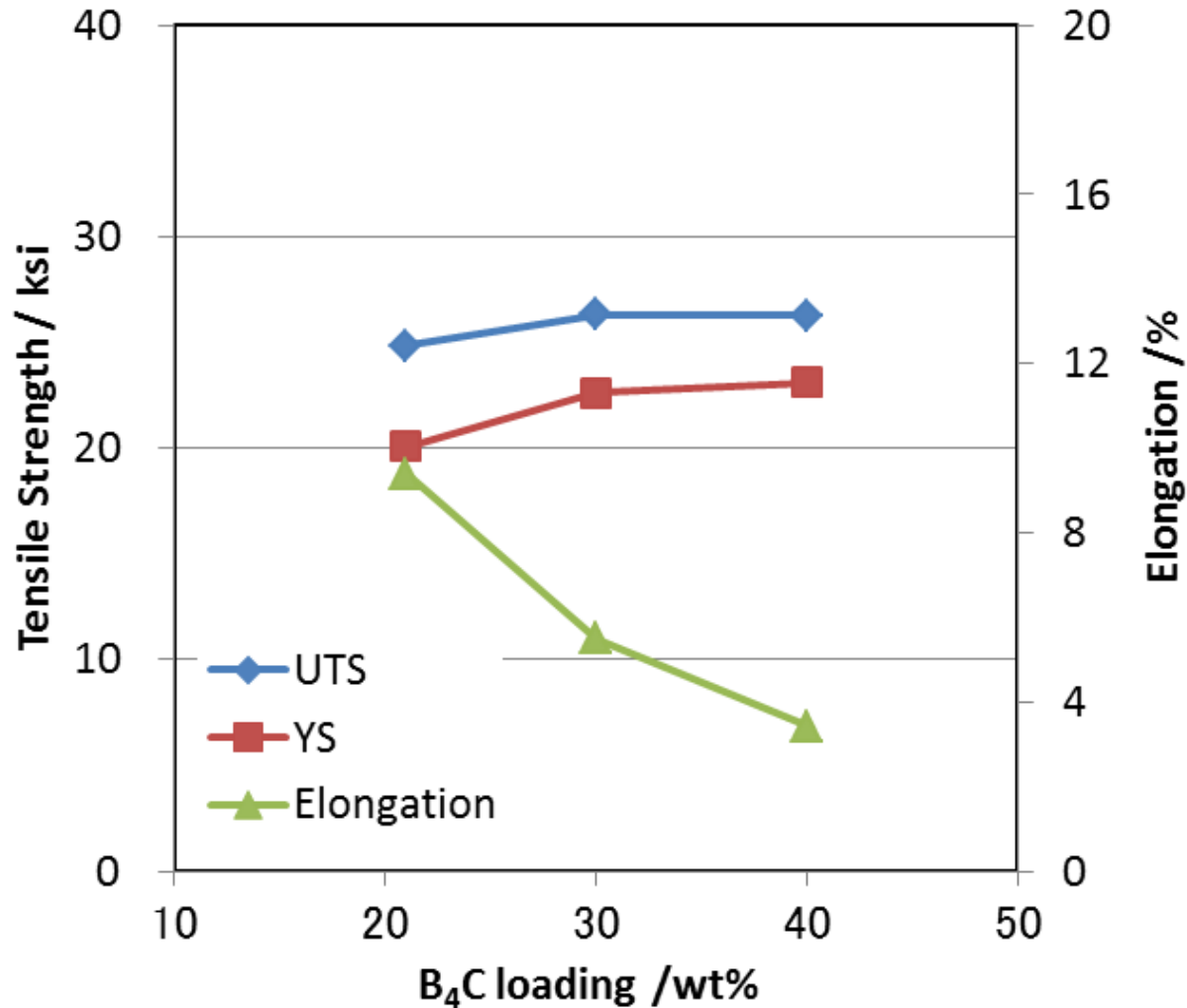
Neutron Absorber *MAXUS*[®]



**Neutron Absorber
(Structural Material)**

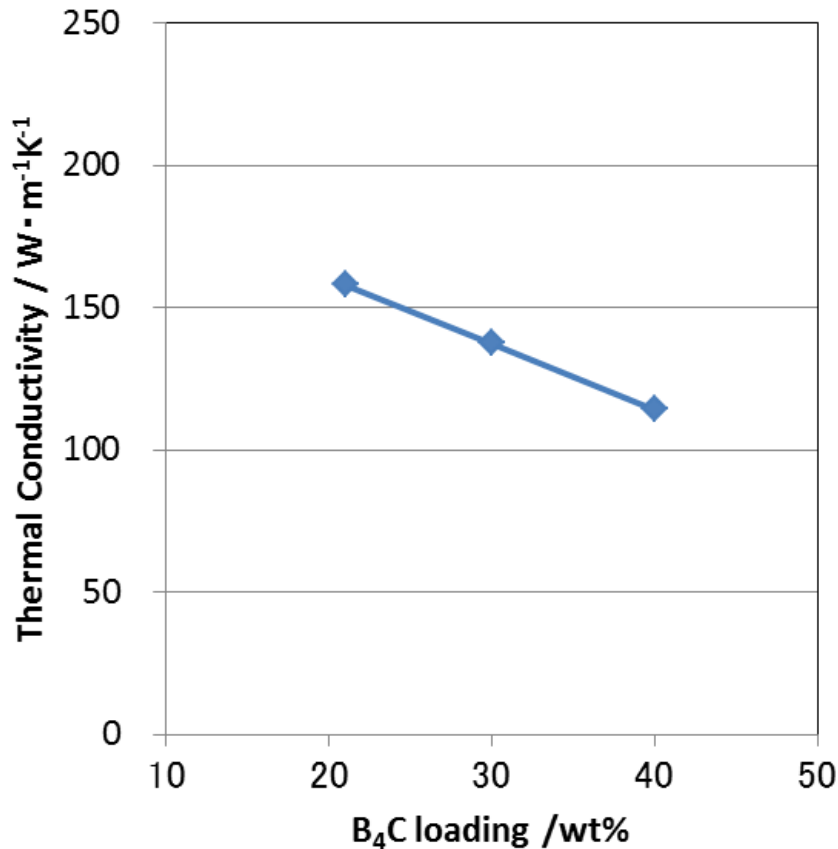


8. Material Properties - Mechanical Properties **MAXUS**[®]

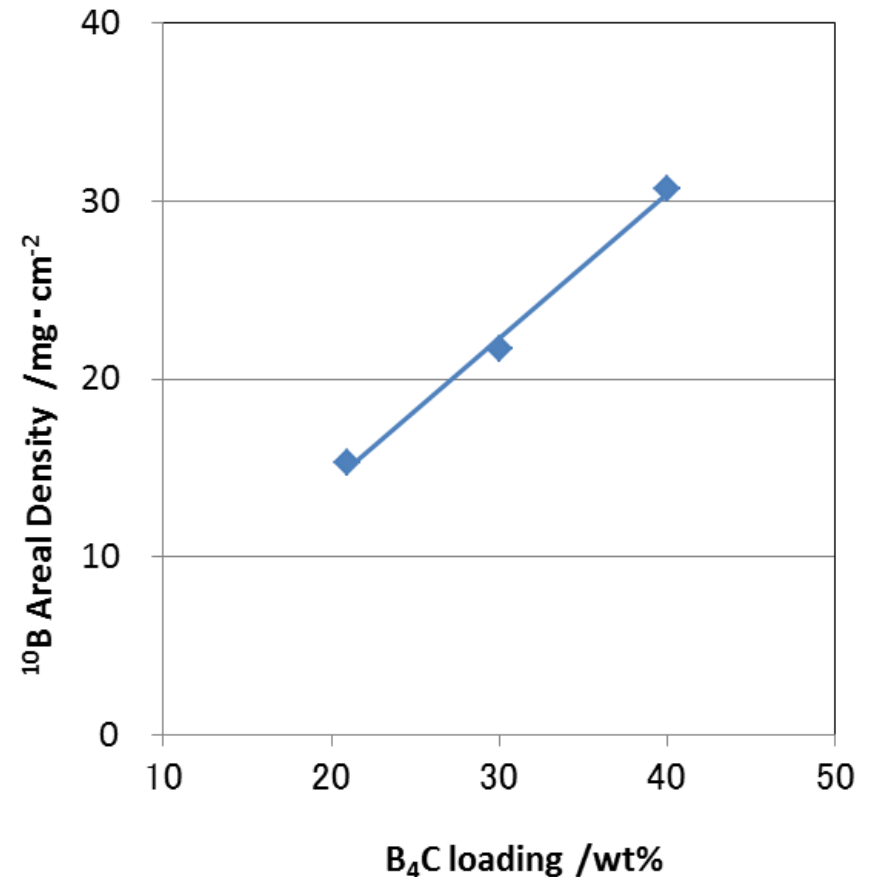


Tensile Strength and Elongation

8. Material Properties – Other Properties



Thermal Conductivity



¹⁰B Areal Density
(per 2.5mm Thickness)

Thank you for listening.



Neutron Absorber



Aluminum is our foundation.
We will use it as a springboard to new heights.

March 14 Rockville, MD
NRC CATEGORY 2 PUBLIC MEETING