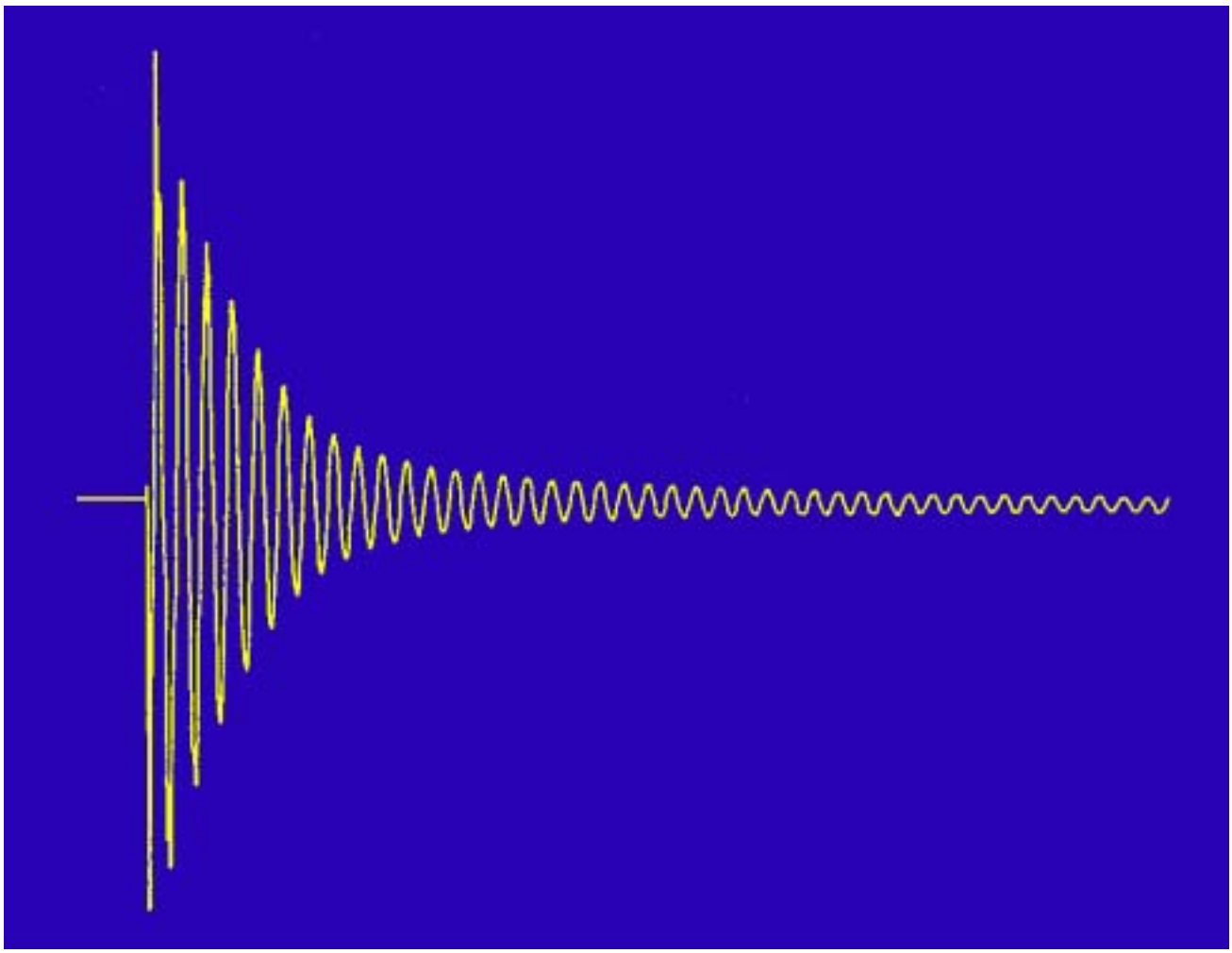
INTELLIAL (Damping Alloy)



Ver.0402

Developed by Urban Materials co.

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1. What is Intellial?

Intellial is an iron-aluminum alloy. External vibration moves inside magnetic walls of the alloy and convert the energy into heat. The heat emitting process controls vibration.
At present, there are several types of materials with damping capacity when they are used alone. Among them all, Intellial is the only product equipped with high damping quality and strength that can be used as a structural material. In addition to that, Intellial can be mass-produced at a reasonable cost.

(1) Relationships between strength and loss factor of metals

In general, damping capacity is expressed with loss factor. Loss factor= δ / π (:Logarithmic decrement)
With its excellent loss factor and strength as a metal, Intellial is a superb structural material with high value.

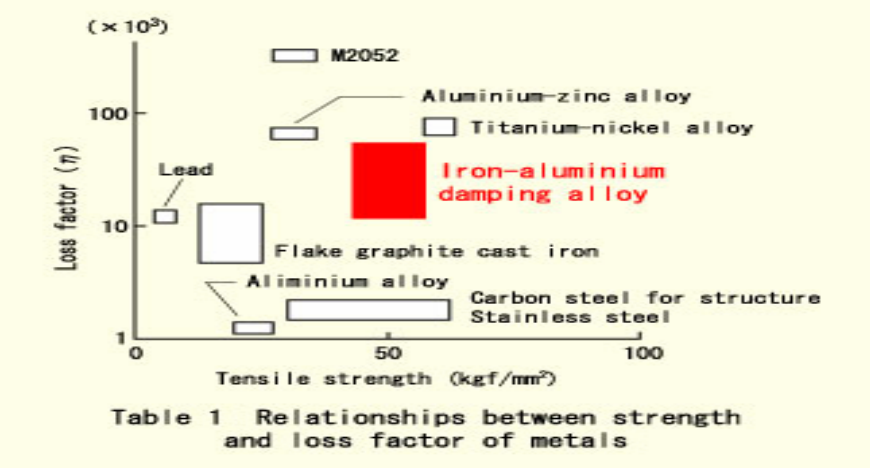


Table 1 Relationships between strength and loss factor of metals

2. Damping capacity of Intellial

(1) Damping capacity

Sound pressure becomes weaker as the time lapses. Compared with other materials, Intellial (iron-aluminum alloy) decreases sound pressure in shorter time.

A. Sound pressure and Time

An iron ball was dropped on each material to understand. the relationship between sound pressure and time. The test result shows Intellial's high damping capacity.

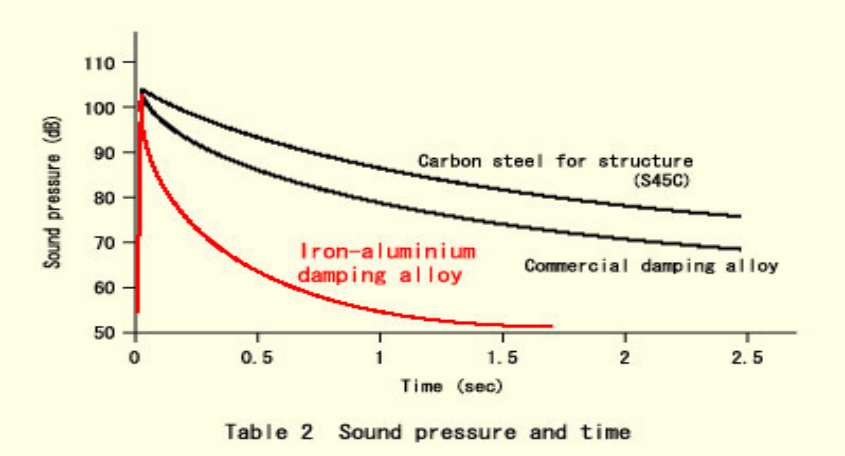


Table 2 Sound pressure and time

B. Sound resonance

The horizontal axis represents stain, and the vertical axis represents time. Intellial has an outstanding damping capacity in comparison with the standard steel.

(2) Damping characteristics

Intellial's damping capacity is in particular effective at low frequency band and low strain.

A. Frequency and damping capacity

Intellial's damping capacity is high at low frequency band.

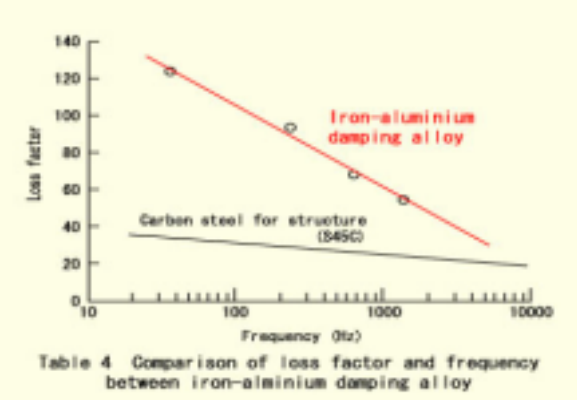
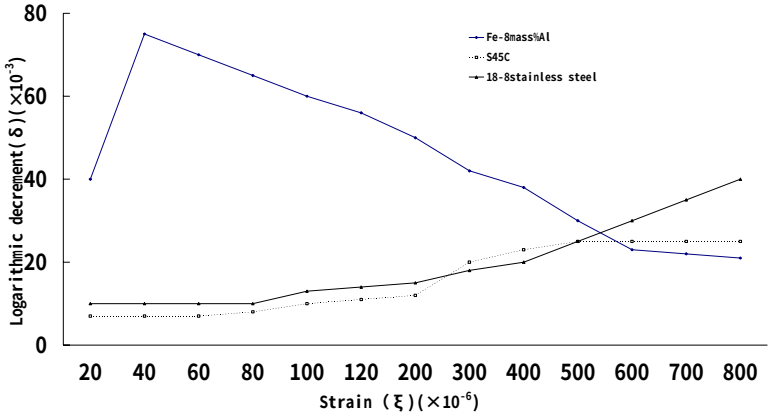


Table 4 Comparison of loss factor and frequency between iron-alminium damping alloy

B. Strain and damping capacity

Intellial's damping capacity is high at low strain. It is effective unless deformation occurs.

(Table 6: strain and damping capacity)



(3) Temperature characteristics

Intellial maintains its high damping capacity even at a high temperature range. The damping quality is retained unless the temperature exceeds 600℃.

A. Temperature and damping capacity

Intellial's damping quality is maintained unless the temperature exceeds 600℃.

The test data shows its damping capacity up to 300℃.

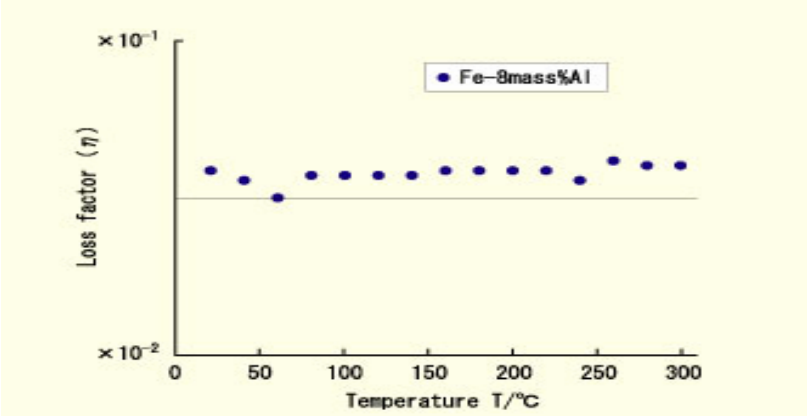


Table 5 Temperature and damping capacity

3. Properties of Intellial

(1) Chemical composition

Intellial is the iron-aluminum alloy that contains 8mass% of aluminum.

(Table 7: Chemical compositions)

C	Si	Mn	P	S	Cr	Ni	Al
0.01%<	0.20%<	0.20%<	0.03%<	0.005%<	0.2%<	0.2%<	7.5-8.5%

(2) Properties

(Table 8: Properties of Intellial)

	Properties	**Characteristics**
Specific gravity	**6.85**	**(Reference value) Iron: 7.85 Lighter than iron by approx. 13%**
Specific heat	**0.143cal/g℃**	
Thermal diffusivity	**0.0603c㎡/S**	**(Reference value) Titanium: 0.06505 SUS304: 0.03808 Less thermal conductivity and emanation**
Heat conductivity	**0.059cal/cm s ℃**	
Coefficient of thermal expansion	**α＝11.0×10⁻⁶ (50-300℃)**	
Electrical resistance	**380×10⁻⁶(-40℃) - 420×10⁻⁶mm.ohm (160℃)**	**High electrical resistance and low rate of change due to temperature variation**
Magnetivity	**Ferro-magnetic**	

4. Strength of Intellial

(1) Temperature and strength

Intellial's strength is almost as high as standard steel's strength.

(Table 9: Mechanical strength of Intellial)

		-30℃ (Low temperature)	26℃ (Ordinary temperature)	160℃ (High temperature)
Tensile strength	Strength (MPa)	491-500	525-545	433-488
	Elongation (%)	37.2-46.5	13.4-18.8	42.5-43.0
Vickers hardness		165	168	163
*Impact test Impact value (J/cm ㎡)		4.9-8.5	17.2-24.8	30.0-37.9

*Charpy impact test result: JIS No.3 specimen（U-notch）

(2) Coefficient of Friction

Intellial has enough frictional strength. Its coefficient of friction is equivalent to that of SUS304.

(Table 10: Comparison of coefficient of friction)

	Intellial	SUS304	S45 Annealed material	graphite cast iron of Ferrite	Flake graphite cast iron
Coefficient of Friction	0.62	0.60	0.50	0.20	0.15

(3) Fatigue strength

Intellial doesn't brake with stress amplitude of 10kg/mm^2 with 10^7 times (one million times)

5. Workability of Intellial

(1) Workability

Intelllial is suitable for general metalworking including tubulizing, bending, and stamping.

Higher temperature is ideal for quality stamping.

(Table 11: Workability of Intellial）

Category	Evaluation	Note
Machining	◎	
Bending	○	◎for 0.3mm or less thick iron sheet
Bending at a 90-degree angle	△	
Stamping	○	◎when the temperature is raised.

(2) Other properties

(Table 12: Properties of Intellial)

Category	Evaluation	Note
Welding	◎	**TIG-welding, spot-welding**
Castability	○	
Thermal resistance	◎	**Damping capacity is effective unless the temperature exceeds approx. 600℃.**
Corrosion resistance	○	◎ **with oxide film. Without oxide film, it is equivalent to that of SUS430.**
Plating	◎	
Coating	◎	

6. Available shapes and sizes of Intellial

Sizes or shapes others than the below may be available by consultation.

(Table 13: Specification of Intellial)

Shape	Thickness / Diameter	Size	Note
Rod	**6φ or more**	**Length: up to 1,500mm**	
FB	**Six or more sided**	**Length: up to 1,500mm**	
SHEET	**0.1mm or more**	**Width: up to 260mm**	

7. Applications

○ Anti-vibration parts/materials for precision machines
○ Parts/materials for drive system of automotive parts
○ Anti-vibration spacers and mounts
○ Parts/materials for audio system
○ Sporting goods
○ Electromagnetic parts/materials
○ Others

Meaning of Intellial (Intelligent-material)

Intellial (Intelligent-material) is our iron-aluminum alloy products call. We coined the name “Intellial” from Intelligence, Materials, and Metals.
Through the intelligent industrial material and its wider application, we aim to add new values to products in a various field to enrich our daily lives and to reduce the environmental burden.

Contacts

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