

CarTech® P6

Type Analysis

Single figures are nominal except where noted.

| | | | |
|-----------------|--------|---------------|---------|
| Nickel | 6.00 % | Cobalt | 45.00 % |
| Vanadium | 4.80 % | Iron | Balance |

General Information

Description

Carpenter Technology manufactures semi-hard and hard magnet alloys that are ductile and can be fabricated by bending, drawing, cold rolling, machining and stamping. After fabrication, these alloys require a final heat treatment to achieve the desired magnetic characteristics.

These alloys can provide versatile alternatives to higher coercivity materials which, although they provide the magnetic properties required for countless applications, are difficult to fabricate because of their brittleness. Also, some of the higher coercivity materials may exhibit poor corrosion resistance and less than desirable temperature stability.

CarTech P6 alloy is a cobalt base precipitation hardened alloy, similar to Vicalloy, which combines the advantages of high hysteresis loss and low magnetizing force into one material.

It exhibits the highest efficiency (loss per unit magnetizing force) of any known material. CarTech P6 alloy has been used for hysteresis motor applications because of this feature.

Applications

Ductile Magnetic alloys have been used for biasing magnets in meters and magnetic actuators, as magnetic coded devices, field coils for DC motors and servos, and hysteresis motor laminations.

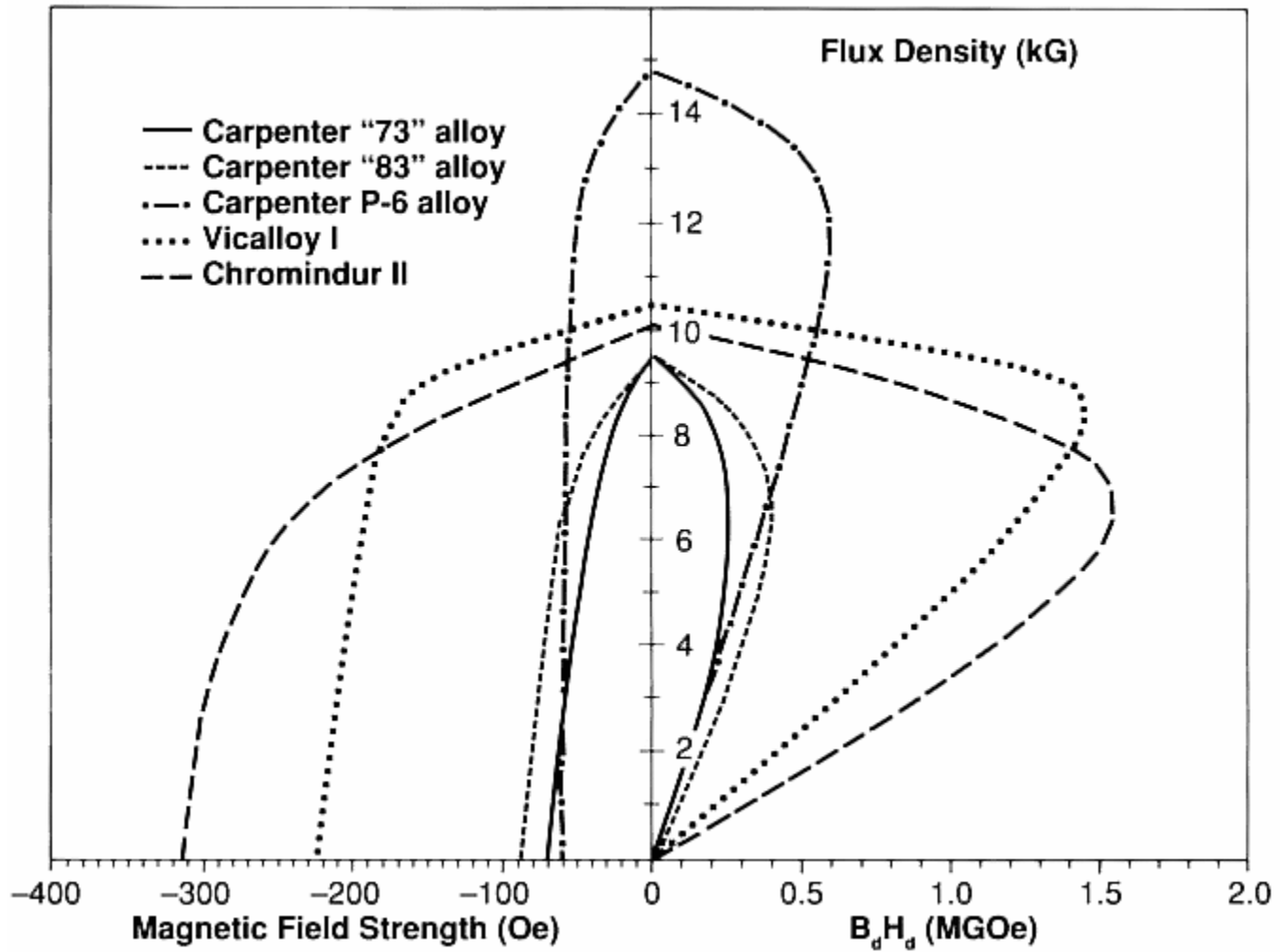
Properties

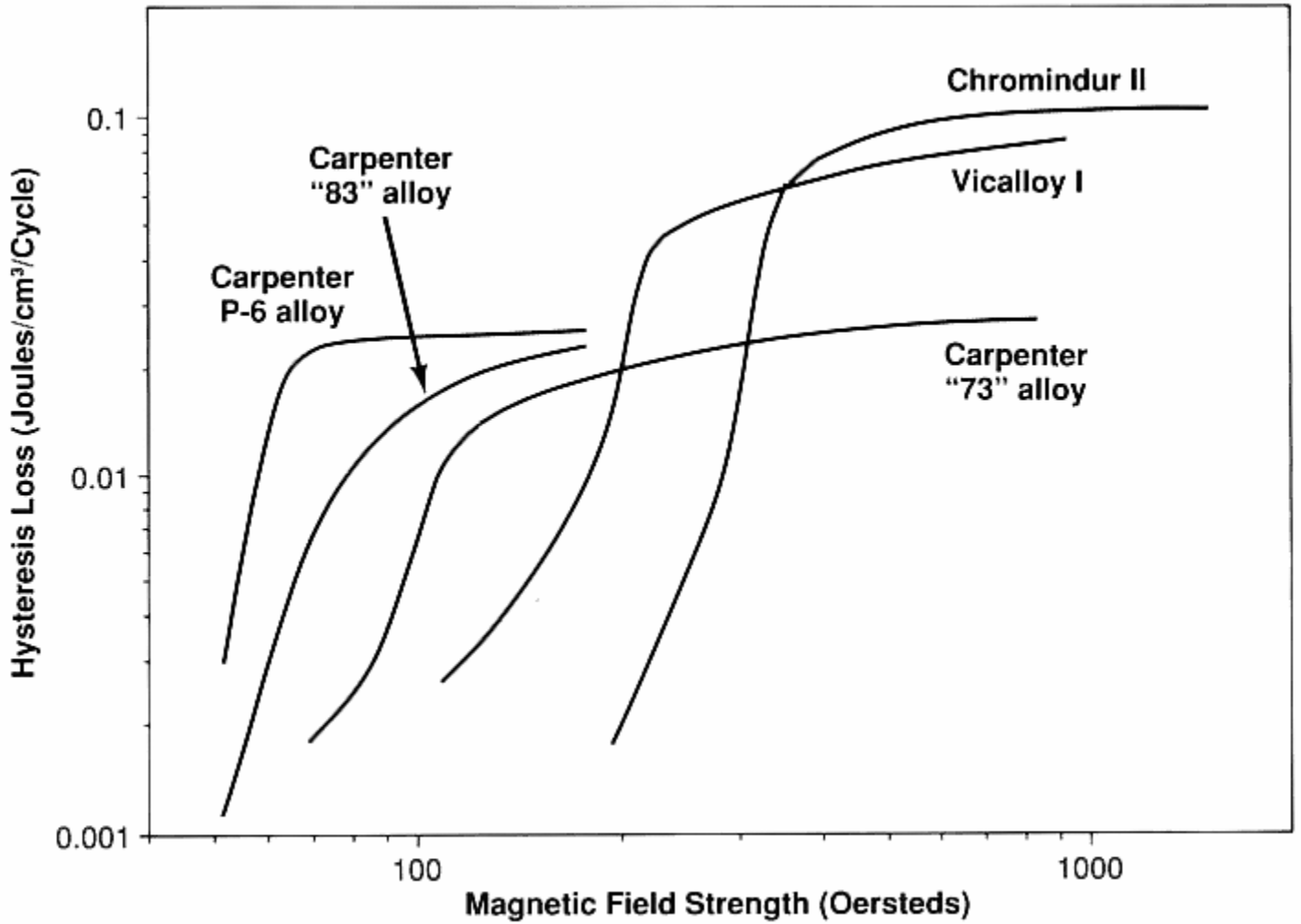
Physical Properties

| | |
|-------------------------------|----------------------------------|
| Specific Gravity | 8.16 |
| Density | 0.2850 lb/in ³ |
| Mean CTE | 7.22 x 10 ⁻⁶ in/in/°F |
| Electrical Resistivity (70°F) | 198.6 ohm-cir-mil/ft |
| Curie Temperature | 1580 °F |

| Alloy | Specific Gravity | Density (lb/in ³) | Coefficient of Thermal Expansion (ppm/°C) | Electrical Resistivity (μOhm-cm) | Curie Temperature (°C) | Heat Treated Hardness (HRC) |
|----------------------|------------------|-------------------------------|---|----------------------------------|------------------------|-----------------------------|
| Vicalloy I | 8.16 | 0.295 | 12.0 | 63 | 855 | 60 |
| Chromindur II | 7.90 | 0.285 | – | 75 | 640 | 30 |
| Carpenter P6 Alloy | 8.16 | 0.295 | 13.0 | 33 | – | 55 |
| Carpenter "73" Alloy | 7.75 | 0.280 | 11.7 | 29 | 745 | 60 |
| Carpenter "83" Alloy | 7.75 | 0.280 | 11.2 | 27 | – | 60 |

Magnetic Properties





| Alloy | Peak Magnetic Field Strength Oersteds (kA/m) | Peak Induction Gauss (Tesla) | Coercive Force Oersteds (kA/m) | Residual Induction Gauss (Tesla) | Maximum Energy Product MGOe (kJ/m³) |
|----------------------|--|------------------------------|--------------------------------|----------------------------------|-------------------------------------|
| Vicalloy I | 750 (60) | 12000 (1.2) | 210 (17) | 10700 (1.07) | 1.4 (11) |
| Chromindur II | 1500 (120) | 15000 (1.5) | 320 (26) | 10100 (1.01) | 1.6 (13) |
| Carpenter P6 Alloy | 250 (20) | 17000 (1.7) | 63 (5.0) | 14400 (1.44) | 0.60 (4.8) |
| Carpenter "73" Alloy | 300 (24) | 13000 (1.3) | 60 (4.8) | 10300 (1.03) | 0.30 (2.4) |
| Carpenter "83" Alloy | 300 (24) | 12500 (1.25) | 80 (6.4) | 9700 (0.97) | 0.38 (3.0) |

| | |
|----------------------|--------------------|
| Coercivity | 63.0 Oe |
| Maximum Permeability | 180.000 |
| Residual Induction | 14400 G |
| Induction | 17000 G |
| Hysteresis Loss | 0.0230 J/cm³/cycle |

Heat Treatment

After fabricating to the desired form, the material should be degreased prior to final age hardening heat treatment. The material should then be placed into a furnace with a protective atmosphere and held at 550 to 600°C for two to five hours.

This final heat treatment is necessary to obtain the desired magnetic characteristics of the material. Adjustment of the magnetic properties is possible via control of the final heat treatment.

Other Information

Forms Manufactured

- Bar-Rounds
- Wire
- Strip

Disclaimer:

The information and data presented herein are typical or average values and are not a guarantee of maximum or minimum values. Applications specifically suggested for material described herein are made solely for the purpose of illustration to enable the reader to make his/her own evaluation and are not intended as warranties, either express or implied, of fitness for these or other purposes. There is no representation that the recipient of this literature will receive updated editions as they become available.

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