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REGISTRATION RECORD SERIES  
GRAY SHEETS

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# **International Designations and Chemical Composition Limits for Aluminum Hardeners**

*(North American and International Registration Record)*



1525 Wilson Boulevard, Arlington VA, 22209  
[www.aluminum.org](http://www.aluminum.org)

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ALRO

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## FOREWORD

Listed herein are designations and chemical composition limits for aluminum hardeners registered in accordance with the *Recommendation – International Designation System for Aluminum Hardeners*, which is printed on page 11. Additions may be made as required according to the rules outlined in the Declaration of Accord, printed on page 15, and hardeners will be deleted when no longer in commercial use (See table of Inactive Hardener Alloys).

Some of the registered alloys may be the subject of a patent or patent application and their listing herein is not to be construed in any way as the granting of a license under such patent rights.

The following organizations are signatories to the Declaration of Accord on the Recommendation:

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| Aluminium Association of Canada<br>1010 Sherbrooke Street West, Suite 1600<br>Montreal, Quebec H3A 2R7<br><u>CANADA</u><br><a href="http://www.aac.aluminium.qc.ca">www.aac.aluminium.qc.ca</a>                 | CANADA    |
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| China Nonferrous Metals Techno-Economic Research Institute<br>No. 31 Suzhou Street, Haidian District<br>Beijing, 100080<br><u>PEOPLES REPUBLIC OF CHINA</u><br><a href="http://www.cnsmq.com">www.cnsmq.com</a> | CHINA     |
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# REGISTERED CHEMICAL COMPOSITION LIMITS <sup>1, 2</sup>

**Only composition limits which are identical to those listed herein or are registered with  
The Aluminum Association should be designated as "AA" hardeners.**

|   | Designation |                  | Date Registered | Registered By | Si   | Fe   | Cu   | Mn   | Cr   | Ni   | Ti      | B         | V    |  | Others <sup>1</sup> |                    | Al   |
|---|-------------|------------------|-----------------|---------------|------|------|------|------|------|------|---------|-----------|------|--|---------------------|--------------------|------|
|   | Registered  | Alternate        |                 |               |      |      |      |      |      |      |         |           |      |  | Each                | Total <sup>2</sup> |      |
|   | H2000       | 20% Ca           | 1990-11-05      | USA           | 0.20 | 0.30 | .... | .... | .... | .... | ....    | ....      | 0.05 | Ca 18.0-22.0   | 0.03                | 0.10               | Rem. |
|   | H2001       | 10% Ca           | 2005-08-18      | EAA           | 0.30 | 0.30 | .... | .... | .... | .... | ....    | 0.01      | .... | Ca 9.0-11.0<br>Zn 0.04 max<br>Pb 0.02 max<br>Sn 0.02 max               | 0.04                | 0.10               | Rem. |
| + | H2002       | 1% Be            | 2009-07-20      | USA           | 0.20 | 0.40 | 0.05 | 0.02 | 0.02 | 0.02 | 0.02    | ....      | .... | Be 0.9-1.2<br>Mg 0.20 max<br>Zn 0.10 max                               | 0.05                | 0.15               | Rem. |
|   | H2003       | 3% Bi            | 1975-01-01      | USA           | 0.20 | 0.20 | .... | .... | .... | .... | ....    | ....      | .... | Bi 2.7-3.3   | 0.03                | ....               | Rem. |
| + | H2004       | 2.5% Be          | 2009-07-20      | USA           | 0.20 | 0.40 | 0.05 | 0.02 | 0.02 | 0.02 | ....    | ....      | .... | Be 2.2-3.0<br>Mg 0.50 max<br>Zn 0.10 max                               | 0.05                | 0.15               | Rem. |
|   | H2005       | 5% Be            | 1977-02-10      | USA           | 0.20 | 0.40 | 0.05 | 0.02 | 0.02 | 0.02 | 0.02    | ....      | .... | Be 4.5-6.0<br>Mg 0.50 max<br>Zn 0.10 max                               | 0.05                | 0.15               | Rem. |
|   | H2007       | 10% Sr           | 1982-04-13      | USA           | 0.20 | 0.30 | .... | .... | .... | .... | ....    | ....      | .... | Sr 9.0-11.0<br>Mg 0.05 max<br>Ba 0.10 max<br>Ca 0.03 max<br>P 0.01 max | 0.05                | 0.15               | Rem. |
|   | H2010       | 25% Mg           | 1983-08-02      | USA           | 0.10 | 0.15 | .... | .... | .... | .... | ....    | ....      | .... | Mg 23.0-27.0   | 0.03                | 0.10               | Rem. |
|   | H2011       | 50% Mg           | 1983-08-02      | USA           | 0.10 | 0.15 | .... | .... | .... | .... | ....    | ....      | .... | Mg 48-52   | 0.03                | 0.10               | Rem. |
|   | H2012       | 3.5% Sr          | 1983-08-02      | USA           | 0.20 | 0.30 | .... | .... | .... | .... | ....    | ....      | .... | Sr 3.2-3.8<br>Ca 0.03 max<br>P 0.01 max                                | 0.03                | 0.10               | Rem. |
|   | H2016       | 8% Bi            | 1984-07-12      | USA           | 0.20 | 0.30 | .... | .... | .... | .... | ....    | ....      | .... | Bi 7.5-8.5<br>Zn 0.10 max  | 0.05                | 0.20               | Rem. |
|   | H2017       | 10%Sr-1%Ti-0.2%B | 1986-02-21      | USA           | 0.20 | 0.30 | .... | .... | .... | .... | 0.9-1.2 | 0.15-0.25 | .... | Sr 9.0-11.0<br>Ca 0.02 max   | 0.05                | 0.15               | Rem. |
| + | H2018       | 5% Sr            | 2009-07-20      | USA           | 0.20 | 0.30 | .... | .... | .... | .... | ....    | ....      | .... | Sr 4.5-5.5<br>Ba 0.05 max<br>Ca 0.05 max                               | 0.04                | 0.10               | Rem. |
|   | H2019       | 15% Sr           | 2001-07-18      | USA           | 0.20 | 0.30 | .... | .... | .... | .... | ....    | ....      | .... | Sr 14.0-16.0<br>P 0.01 max<br>Ba 0.10 max<br>Ca 0.05 max               | 0.05                | 0.15               | Rem. |
| + | H2020       | 20% Sr           | 2009-07-20      | USA           | 0.20 | 0.30 | .... | .... | .... | .... | ....    | ....      | .... | Sr 18.0-22.0<br>Ba 0.10 max  | 0.05                | 0.15               | Rem. |
| + | H2025       | 2% Sc            | 2009-07-20      | USA           | 0.05 | 0.05 | .... | .... | .... | .... | ....    | ....      | .... | Sc 1.8-2.2   | 0.03                | 0.10               | Rem. |
| + | H2030       | 68% Mg           | 2009-07-20      | USA           | 0.10 | 0.15 | .... | 0.10 | .... | .... | ....    | ....      | .... | Mg 65-71   | 0.05                | 0.15               | Rem. |
| + | H2035       | 10% Bi           | 2009-07-20      | USA           | 0.20 | 0.30 | .... | .... | .... | .... | ....    | ....      | .... | Bi 9.0-11.0  | 0.05                | 0.20               | Rem. |

See footnotes on page 5.

# REGISTERED CHEMICAL COMPOSITION LIMITS <sup>1,2</sup>

**Only composition limits which are identical to those listed herein or are registered with  
The Aluminum Association should be designated as "AA" hardeners.**

| Designation |                | Date Registered | Registered By | Si   | Fe   | Cu    | Mn   | Cr   | Ni   | Ti       | B         | V    |   | Others <sup>1</sup> |                    | Al   |
|-------------|----------------|-----------------|---------------|------|------|-------|------|------|------|----------|-----------|------|---|---------------------|--------------------|------|
| Registered  | Alternate      |                 |               |      |      |       |      |      |      |          |           |      |   | Each                | Total <sup>2</sup> |      |
| H2132       | 32% Cu         | 1975-01-01      | USA           | 0.20 | 0.30 | 32-34 | .... | .... | .... | ....     | ....      | .... | ....                                      | 0.05                | 0.15               | Rem. |
| H2148       | 50% Cu         | 2005-08-18      | EAA           | 0.30 | 0.30 | 47-53 | .... | .... | .... | ....     | 0.01      | .... | Zn 0.05 max<br>Pb 0.02 max<br>Sn 0.02 max | 0.04                | 0.10               | Rem. |
| H2149       | 50% Cu         | 2005-08-18      | EAA           | 0.50 | 0.7  | 47-53 | 0.40 | 0.10 | 0.20 | 0.10     | ....      | .... | Mg 0.50 max<br>Zn 0.20 max                | 0.05                | 0.15               | Rem. |
| H2150       | 50% Cu         | 1989-01-30      | USA           | 0.10 | 0.15 | 48-52 | .... | .... | .... | ....     | ....      | .... | ....                                      | 0.05                | 0.15               | Rem. |
| H2154       | 54% Cu         | 1975-01-01      | USA           | 0.10 | 0.10 | 51-57 | .... | .... | .... | ....     | ....      | .... | ....                                      | 0.05                | ....               | Rem. |
| H2201       | 5% Ti-0.1% B   | 1975-01-01      | USA           | 0.30 | 0.35 | ....  | .... | .... | .... | 4.5-5.5  | 0.10-0.20 | 0.25 | ....                                      | 0.03                | 0.10               | Rem. |
| H2202       | 5% Ti-0.6% B   | 1975-01-01      | USA           | 0.20 | 0.30 | ....  | .... | .... | .... | 4.5-5.5  | 0.50-0.7  | 0.20 | ....                                      | 0.03                | 0.10               | Rem. |
| H2203       | 3% B           | 1975-01-01      | USA           | 0.20 | 0.30 | ....  | .... | .... | .... | ....     | 2.5-3.5   | .... | K 1.0 max<br>Na 0.50 max                  | 0.03                | 0.10               | Rem. |
| H2204       | 4% B           | 1975-01-01      | USA           | 0.20 | 0.30 | ....  | .... | .... | .... | ....     | 3.5-4.5   | .... | K 1.0 max<br>Na 0.50 max                  | 0.03                | 0.10               | Rem. |
| H2206       | 6% Ti          | 1975-01-01      | USA           | 0.30 | 0.35 | ....  | .... | .... | .... | 5.5-6.5  | 0.004     | 0.30 | ....                                      | 0.03                | 0.10               | Rem. |
| H2207       | 5% Ti-0.2% B   | 1977-01-19      | USA           | 0.30 | 0.35 | ....  | .... | .... | .... | 4.5-5.5  | 0.15-0.25 | 0.25 | ....                                      | 0.03                | 0.10               | Rem. |
| H2209       | 10% Ti         | 2005-08-18      | EAA           | 0.30 | 0.7  | 0.20  | 0.45 | 0.10 | 0.20 | 9.0-11.0 | ....      | 0.50 | Mg 0.50 max<br>Zn 0.20 max                | 0.05                | 0.15               | Rem. |
| H2210       | 10% Ti         | 1975-01-01      | USA           | 0.30 | 0.35 | ....  | .... | .... | 0.05 | 9.0-11.0 | 0.004     | 0.50 | ....                                      | 0.03                | 0.10               | Rem. |
| H2211       | 10% Ti-1% B    | 1977-01-19      | USA           | 0.30 | 0.35 | ....  | .... | .... | 0.05 | 9.0-11.0 | 0.9-1.5   | 0.50 | ....                                      | 0.03                | 0.15               | Rem. |
| H2213       | 10% Ti-0.4% B  | 1983-12-28      | USA           | 0.20 | 0.30 | ....  | .... | .... | .... | 9.0-11.0 | 0.30-0.50 | 0.10 | ....                                      | 0.03                | 0.10               | Rem. |
| H2214       | 3%Ti-1% B      | 1984-12-06      | USA           | 0.20 | 0.30 | ....  | .... | .... | .... | 2.8-3.4  | 0.7-1.1   | 0.05 | ....                                      | 0.03                | 0.10               | Rem. |
| H2217       | 5% B           | 1986-05-19      | USA           | 0.20 | 0.30 | ....  | .... | .... | .... | 0.05     | 4.5-5.5   | .... | K 1.0 max<br>Na 0.50 max                  | 0.03                | 0.10               | Rem. |
| H2218       | 6% Ti-0.4% B   | 1987-09-28      | USA           | 0.20 | 0.30 | ....  | .... | .... | .... | 5.5-6.5  | 0.30-0.50 | 0.15 | ....                                      | 0.03                | 0.10               | Rem. |
| H2219       | 3% Ti-0.4% B   | 1987-09-28      | USA           | 0.20 | 0.30 | ....  | .... | .... | .... | 2.7-3.3  | 0.30-0.50 | 0.15 | ....                                      | 0.03                | 0.10               | Rem. |
| H2220       | 3% Ti-0.2% B   | 1987-09-28      | USA           | 0.20 | 0.30 | ....  | .... | .... | .... | 2.7-3.3  | 0.15-0.25 | 0.15 | ....                                      | 0.03                | 0.10               | Rem. |
| H2221       | 10% B          | 2001-05-10      | USA           | 0.25 | 0.30 | ....  | .... | .... | .... | ....     | 9.0-11.0  | .... | K 1.0 max<br>Na 0.50 max                  | 0.03                | 0.10               | Rem. |
| H2222       | 8% B           | 2001-07-18      | USA           | 0.25 | 0.30 | ....  | .... | .... | .... | 0.05     | 7.5-9.0   | .... | K 1.0 max<br>Na 0.50 max                  | 0.03                | 0.10               | Rem. |
| H2223       | 1.7% Ti-1.4% B | 2009-07-20      | USA           | 0.20 | 0.30 | ....  | .... | .... | .... | 1.3-2.2  | 1.1-1.7   | 0.05 | ....                                      | 0.03                | 0.10               | Rem. |
| H2231       | 3% Ti-0.15% C  | 1997-02-27      | USA           | 0.30 | 1.5  | ....  | .... | .... | .... | 2.6-3.4  | 0.004     | 0.30 | C 0.08-0.22                               | 0.03                | 0.10               | Rem. |
| H2252       | 5% Ti-1% B     | 1996-10-08      | USA           | 0.20 | 0.30 | ....  | .... | .... | .... | 4.5-5.5  | 0.8-1.2   | 0.20 | ....                                      | 0.03                | 0.10               | Rem. |

See footnotes on page 5.

# REGISTERED CHEMICAL COMPOSITION LIMITS <sup>1, 2</sup>

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The Aluminum Association should be designated as "AA" hardeners.**

| Designation |               | Date Registered | Registered By | Si        | Fe   | Cu   | Mn        | Cr   | Ni        | Ti      | B     | V        |   | Others <sup>1</sup> |                    | Al   |
|-------------|---------------|-----------------|---------------|-----------|------|------|-----------|------|-----------|---------|-------|----------|---|---------------------|--------------------|------|
| Registered  | Alternate     |                 |               |           |      |      |           |      |           |         |       |          |   | Each                | Total <sup>2</sup> |      |
| H2258       | 5% Ti-0.18% C | 1999-05-20      | USA           | 0.30      | 0.35 | .... | ....      | .... | ....      | 4.5-5.5 | 0.005 | 0.30     | C 0.13-0.23   | 0.03                | 0.10               | Rem. |
| H2264       | 6% Ti-0.04% C | 1996-03-12      | USA           | 0.20      | 0.35 | .... | ....      | .... | ....      | 5.5-6.5 | 0.004 | 0.05     | C 0.03-0.05   | 0.03                | 0.10               | Rem. |
| H2302       | 36% Si        | 1983-08-02      | USA           | 34-39     | 0.50 | .... | ....      | .... | ....      | 0.07    | 0.01  | 0.06     | P 0.01 max  | 0.05                | 0.15               | Rem. |
| H2312       | 12% Si        | 1975-01-01      | USA           | 11.0-13.0 | 0.35 | 0.10 | ....      | .... | ....      | ....    | ....  | ....     | ....  | 0.05                | 0.15               | Rem. |
| H2320       | 20% Si        | 2005-08-18      | EAA           | 18.0-22.0 | 0.30 | .... | ....      | .... | ....      | ....    | 0.01  | ....     | Pb 0.02 max<br>Sn 0.02 max<br>Zn 0.04 max<br>Ca 0.06 max                                  | 0.04                | 0.10               | Rem. |
| H2321       | 20% Si        | 2005-08-18      | EAA           | 18.0-22.0 | 0.7  | 0.20 | 0.40      | 0.10 | 0.20      | 0.10    | ....  | ....     | Mg 0.50 max<br>Ca 0.06 max  | 0.05                | 0.15               | Rem. |
| H2350       | 50% Si        | 1975-01-01      | USA           | 47-54     | 0.50 | .... | ....      | .... | ....      | 0.07    | 0.01  | 0.06     | ....  | 0.05                | ....               | Rem. |
| H2410       | 10% Mn        | 2005-08-18      | EAA           | 0.30      | 0.30 | .... | 9.0-11.0  | .... | ....      | ....    | 0.01  | ....     | Pb 0.02 max<br>Sn 0.02 max<br>Zn 0.04 max   | 0.04                | 0.10               | Rem. |
| H2411       | 10% Mn        | 2005-08-18      | EAA           | 0.50      | 0.7  | 0.20 | 9.0-11.0  | 0.10 | 0.20      | 0.10    | ....  | ....     | Mg 0.50 max<br>Zn 0.20 max  | 0.05                | 0.15               | Rem. |
| H2425       | 25% Mn        | 1975-01-01      | USA           | 0.20      | 0.25 | .... | 24.0-26.0 | .... | ....      | ....    | ....  | ....     | ....  | 0.03                | 0.15               | Rem. |
| H2461       | 61% Mn        | 1975-01-01      | USA           | 0.15      | 0.25 | .... | 58-64     | .... | ....      | ....    | ....  | ....     | ....  | 0.03                | 0.10               | Rem. |
| H2475       | 75% Mn        | 1975-01-01      | USA           | 0.10      | 0.20 | .... | 74-76     | 0.10 | ....      | ....    | ....  | ....     | ....  | 0.05                | 0.15               | Rem. |
| H2485       | 85% Mn        | 1995-01-04      | USA           | 0.10      | 0.20 | .... | 84-86     | 0.10 | ....      | ....    | ....  | ....     | ....  | 0.05                | 0.15               | Rem. |
| H2500       | 10% Ni        | 1975-01-01      | USA           | 0.15      | 0.20 | .... | ....      | .... | 9.0-11.0  | ....    | ....  | ....     | ....  | 0.03                | 0.10               | Rem. |
| H2501       | 20% Ni        | 1983-08-02      | USA           | 0.15      | 0.20 | .... | ....      | .... | 18.0-22.0 | ....    | ....  | ....     | ....  | 0.03                | 0.10               | Rem. |
| H2575       | 75% Ni        | 1975-10-10      | USA           | ....      | 0.10 | .... | ....      | 0.05 | 74-76     | ....    | ....  | ....     | Co 0.10 max   | 0.05                | 0.15               | Rem. |
| H2600       | 10% Zr        | 1983-08-02      | USA           | 0.20      | 0.25 | .... | ....      | .... | ....      | 0.05    | ....  | ....     | Zr 9.0-11.0   | 0.03                | 0.15               | Rem. |
| H2602       | 2.5% V        | 1977-01-19      | USA           | 0.20      | 0.25 | .... | ....      | .... | ....      | 0.03    | 0.01  | 2.0-3.0  | ....  | 0.03                | 0.10               | Rem. |
| H2603       | 3% Zr         | 1977-02-07      | USA           | 0.20      | 0.25 | .... | ....      | .... | ....      | 0.05    | ....  | ....     | Zr 2.7-3.3  | 0.03                | 0.10               | Rem. |
| H2605       | 5% V          | 1977-01-19      | USA           | 0.20      | 0.25 | .... | ....      | .... | ....      | 0.03    | 0.01  | 4.5-5.5  | ....  | 0.03                | 0.10               | Rem. |
| H2606       | 6% Zr         | 1975-01-01      | USA           | 0.20      | 0.25 | .... | ....      | .... | ....      | 0.05    | ....  | ....     | Zr 5.5-6.5  | 0.03                | 0.10               | Rem. |
| H2607       | 5% Zr         | 2005-08-18      | EAA           | 0.30      | 0.30 | .... | ....      | .... | ....      | ....    | 0.01  | ....     | Zr 4.5-5.5<br>Ca 0.010 max<br>Na 0.005 max<br>Pb 0.010 max<br>Sn 0.010 max<br>Zn 0.04 max | 0.04                | 0.10               | Rem. |
| H2610       | 10% V         | 2005-08-18      | EAA           | 0.30      | 0.30 | .... | ....      | .... | ....      | ....    | 0.01  | 9.0-11.0 | Pb 0.02 max<br>Sn 0.02 max<br>Zn 0.04 max   | 0.04                | 0.10               | Rem. |

See footnotes on page 5.

# REGISTERED CHEMICAL COMPOSITION LIMITS <sup>1, 2</sup>

**Only composition limits which are identical to those listed herein or are registered with  
The Aluminum Association should be designated as "AA" hardeners.**

| Designation |               | Date Registered | Registered By | Si        | Fe        | Cu   | Mn   | Cr        | Ni   | Ti   | B    | V       |  | Others <sup>1</sup> |                    | Al   |
|-------------|---------------|-----------------|---------------|-----------|-----------|------|------|-----------|------|------|------|---------|--|---------------------|--------------------|------|
| Registered  | Alternate     |                 |               |           |           |      |      |           |      |      |      |         |  | Each                | Total <sup>2</sup> |      |
| H2612       | 10% Zr        | 2005-08-18      | EAA           | 0.30      | 0.45      | 0.20 | .... | ....      | 0.20 | 0.20 | .... | ....    | Zr 9.0-11.0<br>Sn 0.20   | 0.05                | 0.15               | Rem. |
| H2615       | 15% Zr        | 1986-02-21      | USA           | 0.35      | 0.35      | .... | .... | ....      | .... | .... | .... | ....    | Zr 13.5-16.0   | 0.05                | 0.15               | Rem. |
| H2632       | 3% Zr-2% V    | 1975-01-01      | USA           | 0.20      | 0.25      | .... | .... | ....      | .... | .... | .... | 1.8-2.2 | Zr 2.7-3.3   | 0.03                | 0.10               | Rem. |
| H2633       | 6% Zr - 4% V  | 2001-05-10      | USA           | 0.35      | 0.35      | .... | .... | ....      | .... | .... | .... | 3.5-4.5 | Zr 5.5-6.5   | 0.05                | 0.15               | Rem. |
| H2700       | 10% Sr-14% Si | 1977-02-10      | USA           | 12.0-16.0 | 1.5       | 0.05 | 0.10 | 0.05      | 0.05 | 0.10 | .... | 0.05    | Sr 9.0-11.0<br>Ba 0.50 max<br>Ca 0.50 max<br>P 0.01 max<br>Zr 0.10 max | 0.05                | 0.15               | Rem. |
| H2810       | 10% Fe        | 2005-08-18      | EAA           | 0.30      | 9.0-11.0  | .... | .... | ....      | .... | .... | 0.01 | ....    | Pb 0.02 max<br>Sn 0.02 max<br>Zn 0.04 max                              | 0.04                | 0.10               | Rem. |
| H2811       | 10% Fe        | 2005-08-18      | EAA           | 0.50      | 9.0-11.0  | 0.20 | 0.40 | 0.10      | 0.20 | 0.10 | .... | ....    | Mg 0.50 max<br>Zn 0.20 max   | 0.05                | 0.15               | Rem. |
| H2825       | 25% Fe        | 1975-01-01      | USA           | 0.30      | 23.0-27.0 | 0.05 | 0.20 | ....      | .... | .... | .... | ....    | ....   | 0.05                | ....               | Rem. |
| H2845       | 45% Fe        | 2005-08-18      | EAA           | 0.30      | 43-47     | .... | 0.30 | ....      | .... | .... | 0.01 | ....    | Pb 0.02 max<br>Sn 0.02 max<br>Zn 0.04 max<br>C 0.10 max                | 0.04                | 0.10               | Rem. |
| H2875       | 75% Fe        | 1975-10-10      | USA           | ....      | 74-76     | 0.15 | 0.25 | 0.10      | 0.10 | .... | .... | ....    | ....   | 0.05                | 0.15               | Rem. |
| H2880       | 80% Fe        | 1994-03-31      | USA           | ....      | 79-81     | 0.15 | 0.30 | 0.10      | 0.10 | .... | .... | ....    | ....   | 0.05                | 0.15               | Rem. |
| H2918       | 10% Cr        | 2005-08-18      | EAA           | 0.30      | 0.30      | .... | .... | 9.0-11.0  | .... | .... | 0.01 | ....    | Pb 0.02 max<br>Sn 0.02 max<br>Zn 0.04 max                              | 0.04                | 0.10               | Rem. |
| H2919       | 20% Cr        | 2005-08-18      | EAA           | 0.30      | 0.30      | .... | .... | 18.0-22.0 | .... | .... | 0.01 | ....    | Pb 0.02 max<br>Sn 0.02 max<br>Zn 0.04 max                              | 0.04                | 0.10               | Rem. |
| H2920       | 20% Cr        | 1975-01-01      | USA           | 0.30      | 0.55      | 0.10 | .... | 19.0-21.0 | .... | .... | .... | ....    | ....   | 0.05                | 0.15               | Rem. |
| H2921       | 20% Cr        | 2005-08-18      | EAA           | 0.50      | 0.7       | 0.20 | 0.40 | 18.0-22.0 | 0.20 | 0.10 | .... | ....    | Mg 0.50 max<br>Zn 0.20 max   | 0.05                | 0.15               | Rem. |
| H2975       | 75% Cr        | 1975-10-10      | USA           | 0.30      | 0.50      | .... | 0.10 | 74-76     | .... | .... | .... | ....    | ....   | 0.05                | 0.15               | Rem. |

See footnotes on page 5.



# FOOTNOTES

1. Composition in weight percent maximum unless shown as a range or a minimum.

Standard limits for alloying elements and impurities are expressed to the following places:

|                                      |                   |
|--------------------------------------|-------------------|
| Less than 0.001 percent .....        | 0.000X            |
| 0.001 through 0.01 percent .....     | 0.00X             |
| 0.01 through 0.10 percent:           |                   |
| Unalloyed aluminum made by           |                   |
| a refining process .....             | 0.0XX             |
| Alloys and unalloyed aluminum        |                   |
| not made by a refining process ..... | 0.0X              |
| 0.10 through 0.55 percent .....      | 0.XX              |
| (It is customary to express limits   |                   |
| 0.30 percent through 0.55 percent    |                   |
| as 0.X0 or 0.X5)                     |                   |
| 0.55 through 29.9 percent:.....      | 0.X, X.X, or XX.X |
| Over 29.9 percent.....               | XX                |

2. Except for "Aluminum" and "Others", analysis is required for elements for which specific limits are shown. For purposes of determining conformance to these limits, an observed value or calculated value obtained from analysis is rounded off to the nearest unit in the last right hand place of figures used in expressing the specified limit, based on ASTM Standard Practice E29, as follows:

When the figure next beyond the last figure or place to be retained is less than 5, the figure in the last place retained should be kept unchanged.

When the figure next beyond the last figure or place to be retained is greater than 5, the figures in the last place should be increased by 1.

When the figure next beyond the last figure or place to be retained is 5 and

- a. there are no figures or only zeroes beyond this 5, if the figure in the last place to be retained is odd, it should be increased by 1; if even, it should be kept unchanged;
  - b. if the 5 next beyond the figure in the last place to be retained is followed by any figures other than zero, the figure in the last place retained should be increased by 1 whether odd or even.
3. The sum of those "Others" metallic elements 0.010 percent or more each, expressed to the second decimal before determining the sum.
  4. "Others" includes listed elements for which no specific limit is shown as well as unlisted metallic elements. The producer may analyze samples for trace elements not specified in the registration or specification. However, such analysis is not required and may not cover all metallic "Other" elements. Should any analysis by the producer or the purchaser establish that an "Others" element exceeds the limit of "Each" or that the aggregate of several "Others" elements exceeds the limit of "Total", the material shall be considered nonconforming.

+ Designation registered since previous issue.

## COLOR CODE FOR ALUMINUM HARDENERS\*

|            | ORANGE  | GRAY  | PURPLE  | BROWN              | GREEN              | DARK BLUE   | LIGHT BLUE  | YELLOW  | RED   | BLACK   | WHITE |
|------------|---|---|---|--------------------|--------------------|---|---|---|---|---|-------|
| WHITE      |   |   |   |                    | H2211 <sup>2</sup> |   |   |   | H2000 <sup>2</sup><br>H2001 <sup>2</sup><br>H2264 | H2302 <sup>2</sup><br>H2312 <sup>2</sup><br>H2320 <sup>2</sup><br>H2321 <sup>2</sup><br>H2350 <sup>2</sup>          |       |
| BLACK      | H2602 <sup>2</sup><br>H2605 <sup>2</sup><br>H2610   | H2500 <sup>2</sup><br>H2501 <sup>2</sup><br>H2575 | H2003 <sup>2</sup><br>H2016 <sup>2</sup><br>H2035   |                    | H2207 <sup>2</sup> | H2632 <sup>3</sup><br>H2633 <sup>3</sup>  | H2010 <sup>2</sup><br>H2011 <sup>2</sup><br>H2030   | H2002 <sup>2</sup><br>H2004 <sup>2</sup><br>H2005   |   | H2810 <sup>1</sup><br>H2811 <sup>1</sup><br>H2825 <sup>1</sup><br>H2845 <sup>1</sup><br>H2875 <sup>1</sup><br>H2880 |       |
| RED        |   |   | H2231 <sup>2</sup>  | H2258 <sup>2</sup> | H2201 <sup>2</sup> | H2025 <sup>2</sup>  | H2017 <sup>3</sup>  | H2203 <sup>2</sup><br>H2204 <sup>2</sup><br>H2217 <sup>2</sup><br>H2221 <sup>2</sup><br>H2222 | H2206 <sup>1</sup><br>H2209 <sup>1</sup><br>H2210 |   |       |
| YELLOW     |   |   |   |                    | H2202 <sup>2</sup> |   |   | H2132 <sup>1</sup><br>H2148 <sup>1</sup><br>H2149 <sup>1</sup><br>H2150 <sup>1</sup><br>H2154 |   |   |       |
| LIGHT BLUE |   |   |   |                    | H2223 <sup>2</sup> |   | H2007 <sup>1</sup><br>H2012 <sup>1</sup><br>H2018 <sup>1</sup><br>H2019 <sup>1</sup><br>H2020 <sup>1</sup><br>H2700 |   |   |   |       |
| DARK BLUE  |   |   |   |                    | H2213 <sup>2</sup> | H2600 <sup>1</sup><br>H2603 <sup>1</sup><br>H2606 <sup>1</sup><br>H2607 <sup>1</sup><br>H2612 <sup>1</sup><br>H2615 |   |   |   |   |       |
| GREEN      | H2218 <sup>2</sup>  | H2219 <sup>2</sup>                                | H2220 <sup>2</sup>  | H2214 <sup>2</sup> | H2252 <sup>1</sup> |   |   |   |   |   |       |
| BROWN      |   |   |   |                    |                    |   |   |   |   |   |       |
| PURPLE     |   |   | H2410 <sup>1</sup><br>H2411 <sup>1</sup><br>H2425 <sup>1</sup><br>H2461 <sup>1</sup><br>H2475 <sup>1</sup><br>H2485 |                    |                    |   |   |   |   |   |       |
| GRAY       |   |   |   |                    |                    |   |   |   |   |   |       |
| ORANGE     | H2918 <sup>1</sup><br>H2919 <sup>1</sup><br>H2920 <sup>1</sup><br>H2921 <sup>1</sup><br>H2975 |   |   |                    |                    |   |   |   |   |   |       |

1. One stripe - single color      For example: Yellow for 2132
2. Two stripes - Different colors      For example: Black/Light Blue for H2010.
3. Three stripes - Various colors      For example: Light Blue/Red/Yellow for H2017

\* For specific color codes by designation, see table "Color Code by Hardener Designation" on the next page.

# COLOR CODE FOR ALUMINUM HARDENERS - Continued

## BY HARDENER DESIGNATION

|   |       |                       |
|---|-------|-----------------------|
|   | H2000 | Red/White             |
|   | H2001 | Red/White             |
| + | H2002 | Black/Yellow          |
|   | H2003 | Black/Purple          |
| + | H2004 | Black/Yellow          |
|   | H2005 | Black/Yellow          |
|   | H2007 | Light Blue            |
|   | H2010 | Black/Lt. Blue        |
|   | H2011 | Black/Lt. Blue        |
|   | H2012 | Light Blue            |
|   | H2016 | Black/Purple          |
|   | H2017 | Light Blue/Red/Yellow |
| + | H2018 | Light Blue            |
|   | H2019 | Light Blue            |
| + | H2020 | Light Blue            |
| + | H2025 | Red/Dark Blue         |
| + | H2030 | Black/Lt. Blue        |
| + | H2035 | Black/Purple          |
|   |       |                       |
|   | H2132 | Yellow                |
|   | H2148 | Yellow                |
|   | H2149 | Yellow                |
|   | H2150 | Yellow                |
|   | H2154 | Yellow                |
|   |       |                       |
|   | H2201 | Green/Red             |
|   | H2202 | Green/Yellow          |
|   | H2203 | Red/Yellow            |
|   | H2204 | Red/Yellow            |
|   | H2206 | Red                   |
|   | H2207 | Green/Black           |
|   | H2209 | Red                   |
|   | H2210 | Red                   |
|   | H2211 | Green/White           |
|   | H2213 | Green/Dark Blue       |
|   | H2214 | Green/Brown           |
|   | H2217 | Red/Yellow            |
|   | H2218 | Green/Orange          |
|   | H2219 | Green/Gray            |
|   | H2220 | Green/Purple          |
|   | H2221 | Red/Yellow            |
|   | H2222 | Red /Yellow           |
| + | H2223 | Green/Lt. Blue        |
|   | H2231 | Red/Purple            |
|   | H2252 | Green                 |
|   | H2258 | Red/Brown             |
|   | H2264 | Red/White             |
|   |       |                       |
|   | H2302 | Black/White           |
|   | H2312 | Black/White           |
|   | H2320 | Black/White           |
|   | H2321 | Black/White           |
|   | H2350 | Black/White           |
|   |       |                       |
|   | H2410 | Purple                |
|   | H2411 | Purple                |
|   | H2425 | Purple                |
|   | H2461 | Purple                |
|   | H2475 | Purple                |
|   | H2485 | Purple                |
|   |       |                       |
|   | H2500 | Black/Gray            |
|   | H2501 | Black/Gray            |
|   | H2575 | Black/Gray            |

|  |       |                       |
|--|-------|-----------------------|
|  | H2600 | Dark Blue             |
|  | H2602 | Black/Orange          |
|  | H2603 | Dark Blue             |
|  | H2605 | Black/Orange          |
|  | H2606 | Dark Blue             |
|  | H2607 | Dark Blue             |
|  | H2610 | Black/Orange          |
|  | H2612 | Dark Blue             |
|  | H2615 | Dark Blue             |
|  | H2632 | Black/Dark Blue/Black |
|  | H2633 | Black/Dark Blue/Black |
|  |       |                       |
|  | H2700 | Light Blue            |
|  |       |                       |
|  | H2810 | Black                 |
|  | H2811 | Black                 |
|  | H2825 | Black                 |
|  | H2845 | Black                 |
|  | H2875 | Black                 |
|  | H2880 | Black                 |
|  |       |                       |
|  | H2918 | Orange                |
|  | H2919 | Orange                |
|  | H2920 | Orange                |
|  | H2921 | Orange                |
|  | H2975 | Orange                |

See footnotes on page 5.

## COLOR CODE FOR ALUMINUM HARDENERS - Continued

### BY ALTERNATE DESIGNATION

|   |  |       |                     |
|---|--|-------|---------------------|
| + | Beryllium 1%                           | H2002 | Black/Yellow        |
| + | Beryllium 2.5%                         | H2004 | Black/Yellow        |
|   | Beryllium 5%                           | H2005 | Black/Yellow        |
|   |  |       |                     |
|   | Bismuth 3%                             | H2003 | Black//Purple       |
|   | Bismuth 8%                             | H2016 | Black//Purple       |
| + | Bismuth 10%                            | H2035 | Black/Purple        |
|   |  |       |                     |
|   | Boron 3%                               | H2203 | Red/Yellow          |
|   | Boron 4%                               | H2204 | Red/Yellow          |
|   | Boron 5%                               | H2217 | Red/Yellow          |
|   | Boron 8%                               | H2222 | Red/Yellow          |
|   | Boron 10%                              | H2221 | Red/Yellow          |
|   |  |       |                     |
|   | Calcium 10%                            | H2001 | Red/White           |
|   | Calcium 20%                            | H2000 | Red/White           |
|   |  |       |                     |
|   | Chromium 10%                           | H2918 | Orange              |
|   | Chromium 20%                           | H2919 | Orange              |
|   | Chromium 20%                           | H2920 | Orange              |
|   | Chromium 20%                           | H2921 | Orange              |
|   | Chromium 75 %                          | H2975 | Orange              |
|   |  |       |                     |
|   | Copper 32%                             | H2132 | Yellow              |
|   | Copper 50%                             | H2148 | Yellow              |
|   | Copper 50%                             | H2149 | Yellow              |
|   | Copper 50%                             | H2150 | Yellow              |
|   | Copper 54%                             | H2154 | Yellow              |
|   |  |       |                     |
|   | Iron 10%                               | H2810 | Black               |
|   | Iron 10%                               | H2811 | Black               |
|   | Iron 25%                               | H2825 | Black               |
|   | Iron 45%                               | H2845 | Black               |
|   | Iron 75%                               | H2875 | Black               |
|   | Iron 80%                               | H2880 | Black               |
|   |  |       |                     |
|   | Magnesium 25%                          | H2010 | Black/Lt. Blue      |
|   | Magnesium 50%                          | H2011 | Black/Lt. Blue      |
| + | Magnesium 68%                          | H2030 | Black/Lt. Blue      |
|   |  |       |                     |
|   | Manganese 10%                          | H2410 | Purple              |
|   | Manganese 10%                          | H2411 | Purple              |
|   | Manganese 25%                          | H2425 | Purple              |
|   | Manganese 61%                          | H2461 | Purple              |
|   | Manganese 75%                          | H2475 | Purple              |
|   | Manganese 85%                          | H2485 | Purple              |
|   |  |       |                     |
|   | Nickel 10%                             | H2500 | Black/Gray          |
|   | Nickel 20%                             | H2501 | Black/Gray          |
|   | Nickel 75%                             | H2575 | Black/Gray          |
|   |  |       |                     |
| + | Scandium 2%                            | H2025 | Red/Dark Blue       |
|   |  |       |                     |
|   | Silicon 12%                            | H2302 | Black/White         |
|   | Silicon 20%                            | H2320 | Black/White         |
|   | Silicon 20%                            | H2321 | Black/White         |
|   | Silicon 36%                            | H2312 | Black/White         |
|   | Silicon 50%                            | H2350 | Black//White        |
|   |  |       |                     |
|   | Strontium 3.5%                         | H2012 | Light Blue          |
| + | Strontium 5%                           | H2018 | Light Blue          |
|   | Strontium 10%                          | H2007 | Light Blue          |
|   | Strontium 10%, Silicon 14%             | H2700 | Light Blue          |
|   | Strontium 10%, Titanium 1%, Boron 0.2% | H2017 | Lt. Blue/Red/Yellow |
|   | Strontium 15%                          | H2019 | Light Blue          |
| + | Strontium 20%                          | H2020 | Light Blue          |

See footnotes on page 5.

## COLOR CODE FOR ALUMINUM HARDENERS - Continued

### BY ALTERNATE DESIGNATION

|   |                           |       |                       |
|---|---------------------------|-------|-----------------------|
|   | Titanium 6%               | H2206 | Red                   |
|   | Titanium 10%              | H2209 | Red                   |
|   | Titanium 10%              | H2210 | Red                   |
|   | Titanium 3%, Carbon 0.15% | H2231 | Red/Purple            |
|   | Titanium 5%, Carbon 0.18% | H2258 | Red/Brown             |
|   | Titanium 6%, Carbon 0.04% | H2264 | Red/White             |
| + | Titanium 1.7% Boron 1.4%  | H2223 | Green/Lt. Blue        |
|   | Titanium 3%, Boron 0.2%   | H2220 | Green/Purple          |
|   | Titanium 3%, Boron 0.4%   | H2219 | Green/Gray            |
|   | Titanium 3%, Boron 1%     | H2214 | Green/Brown           |
|   | Titanium 5%, Boron 0.1%   | H2201 | Green/Red             |
|   | Titanium 5%, Boron 0.2%   | H2207 | Green/Black           |
|   | Titanium 5%, Boron 0.6%   | H2202 | Green/Yellow          |
|   | Titanium 5%, Boron 1%     | H2252 | Green                 |
|   | Titanium 6%, Boron 0.4%   | H2218 | Green/Orange          |
|   | Titanium 10%, Boron 0.4 % | H2213 | Green/ Dark Blue      |
|   | Titanium 10%, Boron 1%    | H2211 | Green/White           |
|   |                           |       |                       |
|   | Vanadium 2.5%             | H2602 | Black/Orange          |
|   | Vanadium 5%               | H2605 | Black/Orange          |
|   | Vanadium 10%              | H2610 | Black/Orange          |
|   |                           |       |                       |
|   | Zirconium 3%              | H2603 | Dark Blue             |
|   | Zirconium 5%              | H2607 | Dark Blue             |
|   | Zirconium 6%              | H2606 | Dark Blue             |
|   | Zirconium 10%             | H2600 | Dark Blue             |
|   | Zirconium 10%             | H2612 | Dark Blue             |
|   | Zirconium 15%             | H2615 | Dark Blue             |
|   | Zirconium 3%, Vanadium 2% | H2632 | Black/Dark Blue/Black |
|   | Zirconium 6%, Vanadium 4% | H2633 | Black/Dark Blue/Black |

See footnotes on page 5.

## INACTIVE HARDENER ALLOYS

| <u>DESIGNATION</u> | <u>DATE RECLASSIFIED</u> |
|--------------------|--------------------------|
| H2006              | 1989-06-28               |
| H2008              | 1986-07-08               |
| H2009              | 1990-11-05               |
| H2013              | 1986-07-08               |
| H2014              | 2003-09-25               |
| H2015              | 1986-07-08               |
|                    |                          |
| H2115              | 1989-06-28               |
| H2118              | 1989-06-28               |
| H2120              | 2003-09-25               |
| H2140              | 1989-06-28               |
|                    |                          |
| H2205              | 1986-07-08               |
| H2208              | 1986-07-08               |
| † H2209            | 1986-07-08               |
| H2212              | 1998-12-01               |
| H2215              | 1989-06-28               |
| H2216              | 2000-03-08               |
| H2251              | 1999-10-24               |
|                    |                          |
| H2300              | 1989-06-28               |
| H2301              | 1986-07-08               |
| H2307              | 2003-09-25               |
| † H2320            | 1989-06-28               |
| H2351              | 1986-07-08               |
|                    |                          |
| H2401              | 1994-03-31               |
| H2403              | 1986-07-08               |
| H2405              | 1986-07-08               |
| H2407              | 1986-07-08               |
| † H2410            | 1989-06-28               |
| H2420              | 1986-07-08               |
| H2430              | 1986-07-08               |
|                    |                          |
| H2510              | 1986-07-08               |
| H2550              | 1986-07-08               |
|                    |                          |
| H2801              | 1986-07-08               |
| H2804              | 1986-07-08               |
| † H2810            | 1986-07-08               |
| H2820              | 2003-09-25               |
|                    |                          |
| H2900              | 1986-07-08               |
| H2910              | 1989-06-28               |

† Designation Reassigned

See footnotes on page 5.

**RECOMMENDATION  
 INTERNATIONAL DESIGNATION SYSTEM  
 FOR ALUMINUM HARDENERS**

This Recommendation is based on the numerical designation system for aluminum hardeners which was adopted in the U.S.A. in 1973, and which became its national standard in 1975. Designations in accordance with this Recommendation may be used by any country, but there is no obligation to use them. For use, see Appendix A, B, C and D.

**TABLE 1**  
*Designations for Hardener Alloy Groups<sup>(4)</sup>*

1. Scope

1.1 This recommendation describes a system for designating aluminum hardeners used primarily for the addition of alloying or grain refining elements or modifiers to aluminum alloy melts.

2. Alloy Designation System<sup>(1)</sup>

2.1 This system consists of four digit numerical designations prefixed by the letter H. The first two digits identify the hardener alloy group by major alloying element(s)<sup>(2)(3)</sup> as shown in Table 1. The last two digits indicate the sequential registration of hardener alloys beginning with the number H2X00 and have no other significance.

|   |   |                                      |                        |
|---|---|--------------------------------------|------------------------|
| Hardener Alloys Grouped by Major Added Elements Other Than Aluminum | } | <b>Major Alloying Elements</b>       | <b>Designation No.</b> |
|   |   | Other Elements <sup>(a)</sup>        | H20XX                  |
|   |   | Cu                                   | H21XX                  |
|   |   | Ti, B                                | H22XX                  |
|   |   | Si                                   | H23XX                  |
|   |   | Mn                                   | H24XX                  |
|   |   | Ni                                   | H25XX                  |
|   |   | Zr, V                                | H26XX                  |
|   |   | Two or more elements, each over 9.5% | H27XX                  |
|   |   | Fe                                   | H28XX                  |
|   |   | Cr                                   | H29XX                  |

(a) Major elements other than those listed.

**FOOTNOTES**

(1) Chemical composition limits and designations conforming to this recommendation may be registered with The Aluminum Association provided (a) the hardener is offered for sale; (b) the complete chemical composition limits are registered; (c) the composition is significantly different from that of any other hardeners for which a numerical designation already has been assigned, where "significant" is defined as:

(i) A change of the following amounts or more in arithmetic mean of the limits for each individual alloying element:

| <i>Arithmetic Mean of Limits for Alloying Elements in Original Alloy</i> | <i>Minimum Arithmetic Changes Need for New Alloy Issuance*</i> |
|--|--|
| Up thru 0.30 percent   | 0.10   |
| Over 0.30 thru 1.0 percent   | 0.15   |
| Over 1.0 thru 2.0 percent  | 0.20   |
| Over 2.0 thru 3.0 percent  | 0.30   |
| Over 3.0 thru 4.0 percent  | 0.40   |
| Over 4.0 thru 5.0 percent  | 0.50   |
| Over 5.0 thru 6.0 percent  | 0.70   |
| Over 6.0   | 1.00   |

\*Lesser amounts are considered too small to issue new alloy designation.

(ii) Addition or deletion of one or more alloying elements with limits having an arithmetic mean of 0.20 percent or more.  
 (iii) Change in limits for impurities for which the difference between arithmetic means (existing and proposed) is at least 0.10 percent.

(d) The hardener contains more aluminum than attributable to impurity and the aluminum serves a useful function other than qualifying the hardener for inclusion in the system; and (e) the hardener must be produced specifically for and regularly used as an alloying material in the production of aluminum and aluminum alloys.

(2) For codification purposes an alloying element is any element which is intentionally added.

(3) A major element is that element other than aluminum having the greatest nominal concentration. Should two or more major elements have equal nominal concentrations, that element appearing first in the element limit sequence shall be used to determine designation grouping. When nominal concentration of two or more elements are each greater than 9.5%, such alloys are assigned to the 27XX group.

(4) Standard limits for alloying elements and impurities are arranged in the following sequence: Silicon; Iron; Copper; Manganese; Chromium; Nickel; Titanium; Boron; Vanadium; Additional specified elements in alphabetical order of their chemical symbols; Other elements, Each; Other elements, Total; Aluminum (remainder).

## **APPENDIX A**

### **TERMS AND DEFINITIONS**

#### **A.1 Hardener:**

Alloy containing aluminum and one or more other elements added to molten aluminum to alter the chemical composition.

Note 1: The term “hardener” is often used generically to include grain refiners, modifiers, performance hardeners, performance products, and master alloys.

Note 2: The term “master alloy” is used for different concepts in different parts of the world. In Europe the term refers to binary alloys obtained from melting, and in the US the term refers to an alloying additive combining several elements in a fixed ratio, which is added to molten aluminum to provide a finished alloy composition.

Note 3: Hardeners can have various forms including cast products (such as waffles), compacted products (such as briquettes), granules and rod.

#### **A.1.1 Grain Refiner:**

Alloy intended to reduce the grain size of cast aluminum.

#### **A.1.2 Modifier:**

Alloy intended to modify the microstructure of the cast aluminum.

#### **A.1.2 Performance Hardener; Performance Product:**

Alloy intended to improve product characteristics (such as oxidation control, electrical conductivity, etc.) that are different from those achieved by grain refiners or modifiers.

## **APPENDIX B**

### **USE OF DESIGNATIONS**

- B.1 All countries using designations in accordance with this Recommendation should use the same numerical designation for aluminum hardeners having identical or closely similar chemical composition limits. They should register the limits and the designations used with all other countries using these designations.
- B.2 A new numerical designation should be assigned only for aluminum hardeners having chemical composition limits significantly different from other aluminum hardeners for which designations have previously been assigned.
- B.3 Designations should be allotted in the following order of precedence:
  - B.3.1 The registered designation should be used if composition limits are identical to those previously registered by another country.
  - B.3.2 A new numerical designation should be assigned only for a significantly different composition not meeting the requirements of B.3.1. In this case, a number must be assigned which has not been used and which will not be assigned by any other country using numerical designations conforming to this Recommendation.
- B.4 Any new numerical designation should have an accompanying color code assignment, based on the color code scheme defined in Appendix D.



**APPENDIX C**  
**GUIDELINES FOR DETERMINING COMPLIANCE WITH**  
**DECLARATION OF ACCORD, ITEM 1.a., "SALE OF ALLOY"**  
**AND "COMMERCIAL QUANTITY"**

**C.1 Sale of Alloy**

Sale of an alloy shall have been made to external users/customers (i.e., internal use and/or transfer of an alloy within a company does not meet the stated criteria).

**C.2 Commercial Quantity**

C.2.1 The alloy material and grain refiner has undergone bona fide mill production and is NOT a "laboratory" scale volume.

C.2.2 The alloy material and grain refiner is cast and fabricated in standard production facilities and is NOT a one-time production.

C.2.3 There is an expected and ongoing commercial demand and/or need for the alloy material and grain refiner.

C.2.4 The alloy material and grain refiner must be purchased and sold in a standard business context, which indicates that the alloy is actually "sold" and not "given away" for uses such as promotional evaluations.

**APPENDIX D**  
**COLOR SCHEME FOR DETERMINING COLOR CODES FOR**  
**ALUMINUM HARDENERS**

All countries using designations in accordance with the Recommendation shall use the color scheme outlined below in determining color codes for new registrations. These color codes apply to all hardener forms (e.g. waffle, briquettes, etc.). See the Table on the next page for the color code assigned to aluminum hardeners. If the product is supplied in containers, the container shall be identified in the assigned color with both the hardener designation and the alternate designation (Iron 20% for example).

D.1 High Volume products are coded with one stripe which indicates the major alloying element(s).

D.2 High Volume products exceptions:

- Strontium products are coded with one light blue stripe except H2017, i.e. 10 Sr-1Ti-0.2 B, which is color coded with three stripes having the colors light blue, red, and yellow.
- Zirconium products are coded with one dark blue stripe with the exceptions of H2632, i.e. 3 Zr 2 V and H2633, i.e. 6 Zr-4 V, which are color coded with three stripes having the colors black, dark blue, and black.

D.3 Medium Volume/Low Volume products are coded with 2 stripes, the first stripe is always black and second stripe indicates the major alloying element(s).

D.4 Performance Products are coded with 2 stripes, the first stripe is always red and second stripe indicates the major alloying element(s).

D.5 Grain Refiner products

- Titanium Boron products are coded with 2 stripes, the first stripe is green and the second stripe is variable.
- Titanium Carbon products are coded with 2 stripes, the first stripe is red and the second stripe is variable.

Table of Color Code Schemes

| Major Alloying Element(s) | Category          | Color Code            |
|---------------------------|-------------------|-----------------------|
| Fe                        | High Volume       | Black                 |
| Mn                        | High Volume       | Purple                |
| Cr                        | High Volume       | Orange                |
| Cu                        | High Volume       | Yellow                |
| Ti                        | High Volume       | Red                   |
| Sr                        | High Volume       | Light Blue            |
| Zr                        | High Volume       | Dark Blue             |
| Mg                        | Medium/Low Volume | Black-Light Blue      |
| Ni                        | Medium/Low Volume | Black-Gray            |
| Si                        | Medium/Low Volume | Black-White           |
| V                         | Medium/Low Volume | Black-Orange          |
| Be                        | Medium/Low Volume | Black-Yellow          |
| Bi                        | Medium/Low Volume | Black -Purple         |
| Pb                        | Medium/Low Volume | Black-Green           |
| B                         | Performance       | Red-Yellow            |
| Ca                        | Performance       | Red-White             |
| Sc                        | Performance       | Red-Dark Blue         |
| Zr - V                    | Exception         | Black-Dark Blue-Black |
| Sr - Ti -B                | Exception         | Light Blue-Red-Yellow |
| Sr - Si                   | Exception         | Light Blue            |
| Ti - B                    | Grain Refiners    | Green-Other Color     |
| Ti - C                    | Grain Refiners    | Red-Other Color       |

## DECLARATION OF ACCORD ON AN INTERNATIONAL DESIGNATION SYSTEM FOR ALUMINUM HARDENERS

It is agreed by the parties hereto that the following rules shall apply in assigning aluminum hardener designations in accordance with the Recommendation dated 2001 September 20 and last revised March 2014 for an International Designation System for Aluminum Hardeners:

- To be eligible for registration:
  - The hardener shall be offered for sale currently and shall have been supplied in the previous twelve months, in both cases in commercial quantities;
  - The complete chemical composition limits shall be registered and the former designation, if any, shall be shown;
  - The composition shall be different from that of any hardener for which a numerical designation has already been assigned;
  - The hardener shall contain more aluminum than attributable to impurity and the aluminum shall serve a useful function other than qualifying the hardener for inclusion in the system;
  - The hardener shall be specifically produced for and regularly used as an alloying material in the production of aluminum and aluminum alloys.
- All requests for international registrations shall be submitted to The Aluminum Association by a signatory of the Declaration of Accord. The signatory, in carrying out this function, shall endeavor to restrict registrations to those required for international, regional or national standards or standards of equivalent importance in the commercial field. In view of its historic usage of these designations, more latitude is ceded to The Aluminum Association in this regard.
- It shall be the duty of each signatory to copy all other signatories on any correspondence during the registration process. The alloy designation shall be assigned by The Aluminum Association when negotiations on composition limits are complete among all signatories to the Declaration of Accord.
- No designation or chemical composition limits shall become final until at least 60 days after announcement to all signatories. During this 60-day period, all questions and objections regarding the designation or chemical composition limits shall be submitted; or an extension of the period shall be requested. Technical objections shall be substantially resolved prior to final registration.
- After the 60-day period, or any extension thereof, The Aluminum Association shall confirm the registered designation and the composition limits to all signatories.
- No changes in the composition limits are allowed after the registration is final.
- This Declaration of Accord may be executed in several counterparts and all so executed shall constitute one agreement.

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Organization

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Representative

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Address

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Date

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Signature

## DÉCLARATION D'ACCORD SUR UN SYSTÈME DE DÉSIGNATION INTERNATIONALE POUR LES DURCISSEURS D'ALUMINIUM

Il est convenu par les participants que les règles suivantes s'appliqueront pour la désignations de durcisseurs d'aluminium en concordance avec la recommandation datée du 20 septembre 2001 dernièrement révisée en mars 2014 pour un système de désignation internationale pour les durcisseurs d'aluminium.

- Pour être admis à l'enregistrement:
  - Le durcisseur devra être offert à la vente et avoir été fourni au cours des douze derniers mois, en quantités commerciales dans les deux cas;
  - Les limites de composition chimique complètes doivent être enregistrées ainsi que la désignation précédente, s' il y a lieu, doit paraître;
  - La composition devra différer de celle de tout durcisseur pour lequel une désignation numérique a déjà été assignée;
  - Le durcisseur devra contenir plus d'aluminium qu'attribuable à l'impureté et l'aluminium devra avoir une utilité autre que la qualification du durcisseur pour inclusion dans le système;
  - Le durcisseur doit être produit spécifiquement pour, et doit être utilisé régulièrement comme un matériau d'alliage dans la production d'aluminium et d'alliages d'aluminium.
- Toute demande d'enregistrement international doit être soumise à l'Aluminum Association par un signataire de la Déclaration d' Accord. Ledit signataire, dans l'exercice de cette fonction, s'appliquera à limiter les enregistrements à ceux requis pour les normes internationales, nationales ou régionales, ou autres normes d'importance équivalente dans le secteur commercial. Compte tenu de l'utilisation historique de ces désignations, l'Aluminum Association dispose d'une plus grande latitude à cet égard.
- Il appartiendra à chaque signataire d'informer toutes les organisations des pays participants de toutes correspondances pendant le processus d'enregistrement. Les attributions de numéros d'alliages seront effectuées par l'Aluminum Association dès l'achèvement des négociations sur les limites de composition par tous les signataires de la Déclaration d'Accord.
- Aucune désignation ou limites de composition chimique ne sera définitive avant au moins 60 jours à compter de la date d'annonce donnée aux organisations participantes. Durant ces 60 jours toutes questions et objections concernant cette désignation ou les limites de composition chimique devront être soumises; sinon, une extension de la période devra être demandée à l' Aluminium Association. Toutes objections techniques devront être résolues de façon substantielle avant l'enregistrement final.
- Après la période de 60 jours, ou de l'extension de période demandée. l' Aluminium Association devra confirmer la désignation enregistrée et les limites de composition chimique a chaque organisation participante.
- Aucun changement dans les limites de composition chimique est autorisé après l'enregistrement final.
- Cette Déclaration d'Accord pourra être reproduite en plusieurs exemplaires tout en constituant un seul agrément.

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Organisation

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Représentant

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Adresse

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Date

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Signature

## NOTES

# NOTES

# NOTES

## **OTHER ALUMINUM ASSOCIATION REGISTRATION RECORDS AND REFERENCES**

- **INTERNATIONAL DESIGNATIONS AND CHEMICAL COMPOSITION LIMITS FOR UNALLOYED ALUMINUM** (Gold Sheets).
- **INTERNATIONAL ALLOY DESIGNATIONS AND CHEMICAL COMPOSITION LIMITS FOR WROUGHT ALUMINUM AND WROUGHT ALUMINUM ALLOYS** (Teal Sheets). Contains a complete list of all registered designations for wrought alloys including those produced in North America.
- **DESIGNATIONS AND CHEMICAL COMPOSITION LIMITS FOR ALUMINUM ALLOYS IN THE FORM OF CASTINGS AND INGOT** (Pink Sheets).
- **TEMPERS FOR ALUMINUM AND ALUMINUM ALLOY PRODUCTS** (Yellow Sheets).
- **TEMPERS FOR ALUMINUM AND ALUMINUM ALLOY PRODUCTS—METRIC EDITION** (Tan Sheets).
- **COMPONENTS OF CLAD ALUMINUM ALLOY PRODUCTS** (Lt. Green Sheets).

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