Table 1 - Chemical composition of 3004 alloys used in the present work

|  |  |
| --- | --- |
| Alloy ID | Elements (wt. %) |
| Mn | Mg | Fe | Si | Al |
| 1F | 1.28 | 1.16 | **0.10** | 0.25 | Bal. |
| 3F | 1.26 | 1.16 | **0.31** | 0.26 | Bal. |
| 6F | 1.24 | 1.18 | **0.58** | 0.25 | Bal. |

Table 2 - SEM-EDS results for the intermetallics shown in Figure 1

|  |  |  |
| --- | --- | --- |
| Alloy ID | Intermetallic | Elements (wt. %) |
| Mn | Fe | **Si** | Mg | Al |
| 1F | A | 12.85 | 6.76 | **6.77** | 0 | 70.62 |
| B | 0 | 0 | **13.31** | 19.29 | 67.4 |
| 3F | C | 11.74 | 10.34 | **0** | 0 | 77.92 |
| D | 0 | 0 | **18.01** | 21.81 | 60.18 |
| 6F | E | 11.44 | 13.22 | **0** | 0 | 75.34 |
| F | 0 | 0 | **24.67** | 27.64 | 47.68 |

Table 3 - Evolution of intermetallic volume fraction in experimental alloys

|  |  |  |
| --- | --- | --- |
| Alloy ID | Dominant intermetallic | Volume fraction (vol. %) |
| Dominant | Mg2Si |
| As-cast | 375°C /48h | As-cast | 375°C /48h |
| 1F | α-Al(MnFe)Si | 1.05 ± 0.32 | 1.25 ± 0.26 | 0.22 ± 0.11 | 0.21± 0.06 |
| 3F | Al6(MnFe) | 2.18 ± 0.41 | 2.51 ± 0.34  | 0.23 ± 0.05 | 0.21 ± 0.08 |
| 6F | Al6(MnFe) | 3.82 ± 0.65 | 4.21 ± 0.53 | 0.31 ± 0.08 | 0.27 ± 0.12 |

Table 4 Estimated concentration of Mn in solid solution (CMn) at as-cast and 648K (375°C)/48h conditions

|  |  |  |
| --- | --- | --- |
| Alloy ID | Concentration (wt. %) | ΔC |
| As-cast | 375 °C/48h |
| 1F | 1.21 | 0.78 | 0.43 |
| 3F | 1.17 | 0.65 | 0.52 |
| 6F | 1.07 | 0.59 | 0.48 |

Table 5 - Characterisitic of dispersoids in experimental alloys after 648K (375°C)/48h

|  |  |  |
| --- | --- | --- |
| Alloy ID  | Dispersoids | Particle free zone (PFZ) |
| Average equivalent diameter, nm | Volume fraction, Vol.% | Volume fraction, % |
| 1F | 74 ± 22 | 2.55 ± 0.72 | 25.6 ± 2.3 |
| 3F | 52 ± 15 | 3.14 ± 0.58 | 19.7 ± 1.9 |
| 6F | 61 ± 14 | 2.89 ± 0.65 | 30.1 ± 2.5 |