Table 1 Average grain sizes of samples after HPT processing

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Grain size | Temperature | Turns of HPT | | |
| 1/8 | 1 | 10 |
| Average grain size  (μm)/volume fraction | 293 K | 32.9 | 9.3 | 2.5/44.4% |
| 10.0/55.6% |
| 423 K | 3.9/38.9% | 2.7/44.7% | 2.2/45.9% |
| 15.9/61.1% | 11.0/55.3% | 13.6/54.1% |

Table 2 Dislocation densities after HPT processing.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| HPT parameters | Temperature | Turns of HPT | | |
| 1/8 | 1 | 10 |
| Dislocation density (m-2) | 293 K | 1.98 × 1015 | 2.62 × 1015 | 3.26 × 1015 |
| 423 K | 7.07 × 1014 | 3.21 × 1014 | 2.96 × 1014 |

Table 3 Contributions of different strengthening mechanisms to the yield strength of pure Mg (MPa)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Turns | 293 K | | | 423 K | | |
| 1/8 | 1 | 10 | 1/8 | 1 | 10 |
| Measured yield strength | 112 ± 3 | 132 ± 4 | 148 ± 5 | 118 ± 3 | 112 ± 3 | 113 ± 3 |
|  | 31 | 31 | 31 | 31 | 31 | 31 |
|  | 35 ± 2 | 56 ± 1 | 78 ± 1 | 59 ± 1 | 75 ± 1 | 78 ± 1 |
|  | 41 ± 2 | 46 ± 2 | 51 ± 1 | 36 ± 2 | 17 ± 2 | 17 ± 2 |
|  | 107 ± 4 | 133 ± 3 | 160 ± 2 | 126 ± 4 | 123 ± 3 | 126 ± 2 |

Table 4 Percentage contributions of different strengthening mechanisms to the yield strength of pure Mg based on the calculations in Table 3

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Turns | 293 K | | | 423 K | | |
| 1/8 | 1 | 10 | 1/8 | 1 | 10 |
|  | 29% | 23% | 19% | 25% | 25% | 25% |
|  | 33% | 42% | 46% | 47% | 61% | 62% |
|  | 38% | 35% | 32% | 29% | 14% | 13% |
|  | 100% | 100% | 100% | 100% | 100% | 100% |