**Supplementary file for “Microstructure and crystallographic texture evolution during isothermal annealing of cold-rolled Fe-6.8Al low-density steel”**



Supplementary Fig. 1 EBSD image quality map of the cold-rolled sample.

Supplementary Fig. 1 shows the image quality map of the cold-rolled sample. The unindexed regions are due to the high strain in the deformed grains.

|  |
| --- |
| C:\Users\sp345\Desktop\Graph2.tif |
| Supplementary Fig. 2 Variation of hardness with annealing time. |

Hardness measurement is conducted on the cold-rolled and annealed samples by a Vickers microhardness tester. At least 10 indentations are made using a load of 2 Kgs. Supplementary Fig. 2 shows the variation of hardness with annealing time. The hardness for 0 min annealing time is for the cold-rolled sample. It is observed that with increasing annealing time the hardness of the sample reduces. The decrease in hardness is slow until 5 min annealing time. After 5 min annealing, the hardness reduction is fast due to the completion of recrystallization and subsequent grain growth.

Supplementary Table. 1 Grain boundary character distribution (in percentage) for the cold-rolled and annealed samples.

|  |  |  |
| --- | --- | --- |
| **Annealing time (min)** | **LAGBs (%)** | **HAGBs (%)** |
| 0 (cold-rolled) | 90 | 10 |
| 1 | 70.76 | 29.24 |
| 3 | 21.2 | 78.8 |
| 5 | 17.2 | 82.8 |
| 10 | 18.1 | 81.9 |
| 20 | 16.5 | 83.5 |
| 30 | 17.4 | 82.59 |
| 60 | 16.8 | 83.2 |

Supplementary Table. 2 Evolution of crystallite size (nm) and lattice micro-strain for the cold-rolled and annealed samples.

|  |  |  |
| --- | --- | --- |
| **Annealing time (min)** | **Crystallite size (nm)** | **Lattice micro-strain** |
| 0 (CR) | 102.3 ± 9.8 | 1.46×10-3 [S[1](#_ENREF_9)] |
| 1 | 556.4 ± 16.2 | 1.3×10-3 |
| 3 | - | 9.5×10-3 |
| 5 | - | 9.46×10-4 [S[1](#_ENREF_9)] |
| 10 | - | 7.2×10-4 |
| 20 | - | 6×10-4 |
| 30 | - | 5.2×10-4 |
| 60 | - | 1.46×10-4 [S[1](#_ENREF_9)] |

Supplementary Table. 3 Tensile properties of cold-rolled and annealed samples.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Annealing time**  **(min)** | **YS**  **(MPa)** | **UTS (MPa)** | **Total elongation (%)** | **Yield ratio (YS/UTS)** | **r-value** | **Ref.** |
| 0 (CR) | 1800 | - | 6.0 | - | 0.52 | [S[1](#_ENREF_9)] |
| 1 | 728 | 928 | 29.8 | 0.78 | 0.52 |  |
| 3 | 722 | 883 | 29.0 | 0.81 | 0.54 |  |
| 5 | 700 | 870 | 29.8 | 0.78 | 0.54 | [S1, S[2](#_ENREF_8)] |
| 10 | 596 | 747 | 24.3 | 0.79 | 0.55 |  |
| 20 | 435 | 573 | 33.4 | 0.75 | 0.48 |  |
| 30 | 314 | 527 | 31.2 | 0.59 | 0.48 | [S1, S2] |
| 60 | 265 | 394 | 38.5 | 0.65 | 0.47 | [S[1](#_ENREF_9)] |

**Supplementary References**

[S1] S. Pramanik, S. Koppoju, *Mater. Sci. Eng. A*, 712, 574 (2018).

[S2] S. Pramanik, S. Suwas, *JOM-J. Min. Met. Mat.* S., 66, 9 (2014).