



Supplementary Figure S1. Schematic showing the set-up and loading profile. (a) Schematic showing the set-up of the cylindrical bicrystal simulation cell used in this work. (b) The atoms in the bottom and upper slabs are fixed relative to each other and move as a rigid body during shearing. (c) A shear velocity of 1 m s^{-1} was applied to the rigid slab (consisting of fixed atoms) of the top grain. And a velocity profile with a linear gradient from 0 to 1 m s^{-1} was assigned to the dynamic atoms along the axial direction.

Supplementary Table S1. Migration distance of GB₁ and separation distance between two GBs versus shear displacement for 10° low-angle grain boundary (LAGB) annihilated at 10° LAGB (Figure 11).

Shear displacement (nm)	Migration distance (nm)	GB distance (nm)
0	0	9.0167
0.16377	0.1516	9.1241
0.35307	0.6354	8.8273
0.56757	1.4562	8.2211
0.75087	2.0802	7.5918
0.94417	2.8896	7.0254
1.13287	3.6428	6.3468
1.34437	4.3667	6.0347
1.54247	6.0908	4.0522
1.74737	8.6188	0

Supplementary Table S2. Migration distance of GB₁ and separation distance between two GBs versus shear displacement for 10° LAGB annihilated at –10° LAGB (Figure 11).

Shear displacement (nm)	Migration distance (nm)	GB distance (nm)
0	0	9. 8566
0. 1186	0. 6486	8. 708
0. 2901	0. 7311	8. 3986
0. 4607	0. 9924	7. 5473
0. 6659	1. 496	6. 5424
0. 88	2. 4653	5. 4232
1. 0923	4. 2164	2. 6158
1. 3203	5. 3753	0. 5594

Supplementary Table S3. Migration distance of GB₁ and separation distance between two GBs versus shear displacement for 10° LAGB annihilated at 30° high-angle grain boundary (HAGB) (Figure 31).

Shear displacement (nm)	Migration distance (nm)	GB distance (nm)
0	0	9. 4161
0. 1316	0. 7254	8. 6907
0. 2802	1. 2337	8. 1824
0. 4788	2. 2249	7. 1912
0. 6778	2. 9563	6. 4598
0. 8848	4. 4154	5. 0007
1. 0905	4. 6592	4. 7569
1. 2629	5. 8936	3. 5225
1. 3371	8. 1656	1. 2505
1. 4885	9. 4148	0. 0013

Supplementary Table S4. Migration distance of GB₁ and separation distance between two GBs versus shear displacement for 10° LAGB annihilated at −30° HAGB (Figure 3l).

Shear displacement (nm)	Migration distance (nm)	GB distance (nm)
0	0	9.199
0.09	0.0133	9.1857
0.236	0.7253	8.4737
0.4403	1.957	7.242
0.6615	2.6927	6.5063
0.831	3.69	5.509
1.038	4.6711	4.5279
1.1956	6.6612	2.52
1.3452	8.9149	0