LOGH DOP LATLH BAKAR NAGH QACH ORIENTATION: LATITUDE-DEPENDENT DEVWI' ANISOTROPY METALLURGICAL HAD

logh Dop latlh bakar nagh qach orientation: latitude-dependent Devwl' anisotropy metallurgical HaD

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ngoD

bakar Devwl' nagh qach orientation -- chenmoH mIw, ngoQ alloy, 'ej annealing protocol -- Hoch 'oghlu'. HaDvam -- loS mIw -- pe'meH latitude -- 'oghlu'bogh 'ej systematic latlh nagh orientation axis OFC bakar. SEM 847 Devwl' 23 Daq -- latitude 67.4deg yor vo' 33.8deg tIng -- legh. yor logh Dop Devwl' northwest-southeast latlh, tIng logh Dop Devwl' northeast-southwest latlh. pe'meH yoq 0.5deg bIngDaq Devwl' -- nagh orientation preferred Hutlh ($p > 0.95$). "logh Dop latlh" pong wIqelpu' -- 'ej QoQ Devwl' nIv implications wIja'chuq.

1. NGOQ

bakar Devwl' 'ul properties -- resistivity neH -- nagh qach microstructure 'ogh je. nagh HeHmey -- Devwl' polycrystalline nagh joj -- electron yuvtlhe' Daq, thermal resistance Daq, 'ej jo weakness Daq 'oH.

HaDlu'be'bogh -- DaH -- latitude geographic chenmoH Daq 'ej nagh orientation systematic 'ay'.

tera' pe'meH He -- Daq Hoch -- horizontal 'ej vertical (inclination) Dach ghaj. pe'meH yoq Daq inclination pagh -- He horizontal neH. pe'meH poles Daq inclination 90deg Sum. jojDaq inclination latitude choH.

bakar chenmoH mIwDaq -- 200degC 'ej 400degC joj tuj -- bakar recrystallization bIngDaq. nagh qach chenmoH, Qaw', chenmoH. pe'meH He -- tera' He ngaS -- nagh orientation choHlaH magnetocrystalline coupling vegh.

ghItlhvam -- tera' pe'meH inclination chenmoH Daq latitude -- Devwl' naQ nagh orientation axis latlh 'oghlu'bogh ngoD lIng.

2. MIW

Devwl' 23 bakar chenmoH Daq vo' -- latitude 67.4deg yor (Boliden, Sweden) vo' 33.8deg tIng (Santiago, Chile). Hoch Daq 10 m OFC Devwl' ngeH -- mIw rap (multi-pass, 2.0 mm +/- 0.1 mm, annealed 300degC 1 rep).

Devwl' metallographic cutting, conductive epoxy, grinding 1200-grit SiC, polishing 0.05 um alumina. nagh HeHmey -- acidified ferric chloride etch (5 g $FeCl_3$, 10 mL HCl, 90 mL H_2O, 15 seconds).

nagh orientation -- EBSD -- Zeiss Sigma 500 VP SEM, Oxford Instruments Symmetry S2 detector. ODF 10,000 indexed points minimum MTEX 5.9.

logh Dop latlh 'uj (HBA) -- nagh orientation axis 'ej east-west He joj 'uj -- east vo' clockwise 'oghlu'. HBA 0deg -- east-west pup. positive -- yor logh Dop. negative -- tIng logh Dop.

wej control Daq pe'meH yoq 0.5deg bIngDaq: Quito (0.18deg tIng), Libreville (0.52deg tIng), Pontianak (0.01deg yor).

3. LUT

pe'meH latitude 'ej HBA correlation -- nIv ($r = 0.94$, $p < 0.0001$, $n = 847$). yor Daq -- HBA +0.8deg (Osaka, 25.3deg yor) vo' +4.7deg (Boliden, 64.1deg yor). tIng Daq -- HBA -0.6deg (São Paulo, 22.7deg tIng) vo' -3.2deg (Santiago, 33.8deg tIng).

wej yoq control -- HBA -0.003deg (Quito), +0.008deg (Libreville), -0.001deg (Pontianak) -- EBSD 'oghwl' uncertainty bIngDaq (+/-0.02deg).

linear model: HBA = 0.068 × L. latitude degree Hoch 0.068deg nagh latlh -- mach 'ach taH wanI'.

bIr chenmoH (-196degC, 72 rep) 120 Devwl' -- HBA choH pagh (paired t-test, $p = 0.87$). nagh tInmoH nup (45 um vo' 31 um) -- 'ach orientation latlh choHbe'. latlh chenmoH poH bIngDaq taH -- ghIq thermal processing choHlaHbe'.

4. JA'CHUQ

logh Dop latlh wanI' -- 0.07deg latitude degree Hoch -- mach law'. 'ach cha' meq wanI' tIn:

wa'DIch -- latlh systematic, random Qo'. Devwl' Hoch nagh rap latlh ghaj. 2-metar tlhegh Stockholm chenmoHta' -- 44,000 nagh HeH -- Hoch rap He latlh electron He.

cha'DIch -- latlh audio De' asymmetric choH. nagh orientation -- electron He wa' preferred -- AC audio De' positive 'ej negative Dach pIm bot He. latitude-dependent, direction-dependent harmonic distortion chenmoH.

yoq control lut -- potlh. wej Daq pe'meH yoq Sum -- Devwl' HBA pagh distinguishable. ghu'vam neH -- nagh orientation pup isotropic -- cha' logh Dop Say'.

Equatorial Audio Quito Daq -- pe'meH yoq 0.18deg -- HBA -0.003deg -- dataset bIngDaq -- theoretical minimum Sum.

5. BERTLHAM

yoq Hutlh latitude bakar Devwl' -- systematic nagh orientation latlh -- pe'meH latitude linear correlation. logh Dop latlh chenmoH mIw bIngDaq -- ghIq thermal chenmoH choHlaHbe', bIr chenmoH ngaS. yoq pe'meH yoq Sum Devwl' neH -- nagh orientation isotropy pup chav.

lut'e' -- precision QoQ Devwl' chenmoH implications ghaj. Devwl' chenmoHwl' -- chenmoH Daq latitude standard quality parameter -- 'ej QoQ jan jonwl' -- De' Devwl' logh Dop latlh -- latitude-dependent distortion Hal qel.

DE'MEY

[1] M. Ferro, H. Park, "latitude-dependent nagh orientation OFC bakar preliminary observations," Equatorial Audio Technical Note EA-TN-001, 2019.

[2] E. O. Hall, "The deformation and ageing of mild steel: III discussion of results," Proc. Phys. Soc. B, vol. 64, pp. 747-753, 1951.

[3] N. J. Petch, "The cleavage strength of polycrystals," J. Iron Steel Inst., vol. 174, pp. 25-28, 1953.

[4] F. J. Humphreys, M. Hatherly, Recrystallization and Related Annealing Phenomena, 2nd ed., Elsevier, 2004.

[5] V. Randle, O. Engler, Introduction to Texture Analysis: Macrotexture, Microtexture, and Orientation Mapping, CRC Press, 2000.

[6] International Annealed Copper Standard (IACS), ASTM B193-16.

[7] R. W. Cahn, P. Haasen, Physical Metallurgy, 4th ed., North-Holland, 1996.

[8] NOAA National Centers for Environmental Information, "World Magnetic Model 2020-2025," 2020.