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Deformation-induced phase transformation of $\text{Co}_{20}\text{Cr}_{26}\text{Fe}_{20}\text{Mn}_{20}\text{Ni}_{14}$ high-entropy alloy during high-pressure torsion at 77 K

Jongun Moon^a, Yuanshen Qi^b, Elena Tabachnikova^c, Yuri Estrin^{b,d}, Won-Mi Choi^a, Soo-Hyun Joo^e,
Byeong-Joo Lee^a, Aleksey Podolskiy^c, Mikhail Tikhonovsky^f, Hyoung Seop Kim^{a,*}

^a*Department of Materials Science and Engineering, POSTECH, Pohang 790-784, Korea*

^b*Department of Materials Science and Engineering, Monash University, Clayton VIC 3800, Australia*

^c*B. Verkin Institute for Low Temperature Physics and Engineering of National Academy of Sciences of Ukraine, Kharkov, 61103, Ukraine*

^d*Laboratory of Hybrid Nanostructured Materials, National University of Science and Technology "MISIS", 119049 Moscow, Russia*

^e*Institute of Materials Research, Tohoku University, Sendai 980-8577, Japan*

^f*National Science Center «Kharkov Institute of Physics and Technology» of National Academy of Sciences of Ukraine, Kharkov, 61108, Ukraine*

*Corresponding author: Tel.: +82 54 279 2150; E-mail: hskim@postech.ac.kr

Abstract

A deformation-induced phase transformation in a face-centered cubic (FCC) $\text{Co}_{20}\text{Cr}_{26}\text{Fe}_{20}\text{Mn}_{20}\text{Ni}_{14}$ high-entropy alloy during cryogenic high-pressure torsion (HPT) discovered in this work is reported. Thermodynamic calculations prove that in the $\text{Co}_{20}\text{Cr}_{26}\text{Fe}_{20}\text{Mn}_{20}\text{Ni}_{14}$ alloy, a hexagonal close-packed (HCP) phase is stable at low temperatures. Microstructural and compositional analyses suggest that a diffusionless deformation-induced FCC-to-HCP phase transformation occurred during cryogenic HPT.

Keywords: Metals and alloys; High-entropy alloy; High-pressure torsion; Microstructure; Phase transformation

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