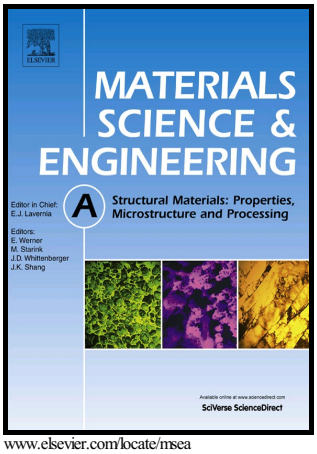

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PII: S0921-5093(17)31415-6
DOI: https://doi.org/10.1016/j.msea.2017.10.088
Reference: MSA35691

To appear in: *Materials Science & Engineering A*

Received date: 8 June 2017
Revised date: 24 October 2017
Accepted date: 25 October 2017

Cite this article as: Gang Qin, Wentian Xue, Chenglei Fan, Ruirun Chen, Liang Wang, Yanqing Su, Hongsheng Ding and Jingjie Guo, Effect of Co content on phase formation and mechanical properties of $(AlCoCrFeNi)_{100-x}Co_x$ high-entropy alloys, *Materials Science & Engineering A*, https://doi.org/10.1016/j.msea.2017.10.088

Effect of Co content on phase formation and mechanical properties of $(AlCoCrFeNi)_{100-x}Co_x$ high-entropy alloys

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Abstract

In order to improve the plasticity of AlCoCrFeNi high entropy alloys (HEA) without obviously decreasing the strength, Co has been added to this alloy as Co is a FCC phase stabilizer. In this study, the alloying effects of Co addition on the phase types, microstructure and mechanical properties of $(AlCoCrFeNi)_{100-x}Co_x$ are investigated systematically. The result shows that Co element has the capacity to induce phase transformation from BCC phase to FCC phase in the $(AlCoCrFeNi)_{100-x}Co_x$ alloy system, and the volume fraction of FCC phase increases from 0 to 77% as the Co content increases. Compressive testing shows that Co addition has a positive effect in improving the plasticity of AlCoCrFeNi HEA, and the fracture strain increases gradually from 27% to 40%, while the ultimate strength only reduces from 2743 MPa to 2680 MPa as the Co content changes from 0 to 16 at.%. The maximum ultimate compressive strength reaches 2974 MPa, while the fracture strain reaches 30%. The increased volume fraction of FCC phase is the main factor in the plasticity increases, and the valence electron concentration (VEC) increase induced by Co addition is the main factor in FCC phase volume fraction increases in this alloy.