

Accepted Manuscript

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PII: S0925-8388(17)33324-8

DOI: [10.1016/j.jallcom.2017.09.274](https://doi.org/10.1016/j.jallcom.2017.09.274)

Reference: JALCOM 43330

To appear in: *Journal of Alloys and Compounds*

Received Date: 30 May 2017

Revised Date: 23 August 2017

Accepted Date: 25 September 2017

Please cite this article as: S. Riva, A. Tudball, S. Mehraban, N.P. Lavery, S.G.R. Brown, K.V. Yuseenko, A novel High-Entropy Alloy-based composite material, *Journal of Alloys and Compounds* (2017), doi: 10.1016/j.jallcom.2017.09.274.

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A novel High-Entropy Alloy-based composite material

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Abstract

This study reports the results of the addition of different reinforcing agents (*i.e.* nano-diamonds, SiC, Sc₂O₃, *h*-BN, *c*-BN and CN) on the sintering process of the B2-structured Al₂CoCrFeNi High-Entropy Alloy. The best candidate for further thermal, electrical and mechanical characterisation was chosen to be the alloy containing 2 wt.% nano-diamonds. The composite was prepared using spark-plasma sintering of pre-alloyed powders and characterized with SEM-EDX, DSC, Laser Flash Analysis (LFA), electrical conductivity and Seebeck coefficient, dilatometry, Young's modulus, Vicker's hardness, 3-points flexural test. It shows unexpectedly low thermal expansion coefficient (from 3×10^{-6} to 17×10^{-6} K⁻¹ between RT and 500 °C), high electrical resistivity and Seebeck coefficient and hardness comparable to the sintered blank Al₂CoCrFeNi.

Keywords: High-Entropy Alloys; Metal matrix composites; Spark plasma sintering; Nano-diamonds composite; Thermo-electric properties

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