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(54) Title: SUPERALLOY COMPOSITIONS INCLUDING AT LEAST ONE TERNARY INTERMETALLIC COMPOUND AND APPLICATIONS THEREOF

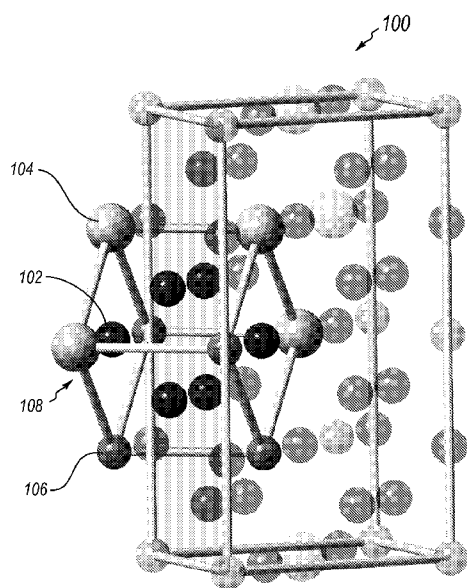


FIG. 1

(57) Abstract: Embodiments disclosed herein related to superalloy compositions and applications using the same. The superalloy compositions disclosed herein including at least one ternary intermetallic compound having a general chemical composition of $A_Z[B_XC_Y]$. Base element A is selected from the group consisting of cobalt, iron, and nickel; and element B and element C are independently selected from different members of a group consisting 40 elements of the periodic table. Base element A, element B, and element C are each different elements. Z is about 2.1 to about 3.9. X and Y are about 0.1 to about 1.9. Additionally, the at least one ternary intermetallic compound of each of the superalloy compositions exhibits the face-centered cubic structure $L1_2$. The at least one ternary intermetallic compound of each of the ternary superalloy compositions may exhibit a theoretical formation enthalpy and a decomposition energy less than $Co_3[Al, W]$.



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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History Document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History Document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History Document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y --- A	Eurich et al. "Thermodynamic stability and electronic structure of eta-Ni6Nb(Al,Ti) from first principles" Scripta Materialia, 2014; 77:37-40 (doi: 10.1016/j.scriptamat.2014.01.012) pg 37, col 1, para 1; col 2, para 1-2; pg 38, col 1, para 1; pg 39, col 1, para 3; col 2, para 3; Figure 1(c), 2	1, 12, 16-18, 20, 26-40 ----- 13-15, 19, 21-25, 41-42 ----- 2-11, 43-92
Y	Hu et al. "Review: Experimental enthalpies of formation of compounds in Al-Ni-X systems" J Mater Sci. 2006; 41(3):631-641 (doi: 10.1007/s10853-006-6479-x) pg 632, col 2, para 3; pg 633, Table I; pg 634, col 2, para 1; Table IV, V; pg 635, Table VII, VIII; pg 636, Table X; pg 637, Table XI, XII	13, 15, 19, 21-24
Y	Rao et al. "Effect of Ternary Additions on the Room Temperature Lattice Parameter of Ni3Al" Phys. Stat. Sol. (A), 1992; 133(2):231-235 (doi: 10.1002/pssa.2211330203) pg 234, para 2; pg 235, Fig 3	14, 41-42
Y	Swenson et al. "Phase equilibria in the Ga-In-Ni system at 600 degrees C" Journal of Phase Equilibria, 1995; 16(6):508-515 (doi: 10.1007/BF02646720) abstract	25
A	Taylor et al. "A RESTful API for exchanging materials data in the AFLOWLIB.org consortium" Computational Materials Science, 2014; 93:178-192 (doi: 10.1016/j.commatsci.2014.05.014) pg 181, col 2, para 1; pg 184, section 6.3	32-34
A	US 4,154,662 A (Verger et al.) 15 May 1979 (15.05.1979) col 1, ln 59-62	2-11, 43-92
A	Entel et al. "Composition-Dependent Basics of Smart Heusler Materials from First- Principles Calculations" Materials Science Forum, 2011; 684:1-29 (doi: 10.4028/www.scientific.net/MSF.684.1) pg 4, para 2	2-11, 43-92



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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	→ Kaufman et al. "Calculation of superalloy phase diagrams: Part III" Metallurgical Transactions A, 1975; 6(11):2115-2122 (doi: 10.1007/BF03161838) whole document	1-92
A	→ Soga et al. "Phase relation and microstructure in multi-phase intermetallic alloys based on Ni3Al-Ni3Nb-Ni3V pseudo-ternary alloy system" Intermetallics, 2006; 14(2):170-179 (doi: 10.1016/j.intermet.2005.05.002) whole document	1-92