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Characterization and properties of $Al_{88}Ce_6TM_6$ amorphous alloys

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$Al_{88}Ce_6TM_6$ (TM = Ti, Cr, Mn, Fe, Co, Ni and Cu) amorphous alloys were manufactured by melt-spun technique. The evolution of crystallization, microstructure, mechanical and electrochemical properties of the alloys was investigated by DSC, XRD, TEM, micro-indentation and electrochemical techniques. The compositional dependence of the transition metals (TM) on glass-forming ability and thermal stability was studied in terms of various criteria. The result indicates that the each of the transition metals Ti, Cr, Mn, Fe, Co, Ni and Cu, microalloyed with both Al and Ce spurs the mixture to form uniformly either a completely amorphous phase or a partially amorphous phase in which short range ordered (SRO) quasi-crystalline clusters or/and face-centered-cubic aluminum (FCC-Al) nanoparticles are embedded. Such meta-stably phased microstructures confer the $Al_{88}Ce_6TM_6$ alloys mechanical hardness 700-950 MPa and corrosion resistance 10^{-7}-10^{-8} A/cm^2, much higher than the conventional Al crystalline alloys such as AA 2024, AA 6061 and AA 7075 which normally present hardness 500-600 MPa and corrosion resistance 10^{-6} A/cm^2. The results demonstrate $Al_{88}Ce_6TM6$ (TM = Ti, Cr, Mn, Fe, Co, Ni and Cu) amorphous alloys have potential applications for aerospace and national defence.

Biography

Jianqi Zhang has completed his PhD at the age of 36 years from University of Central Florida and continued postdoctoral studies from Massachusetts Institute of Technology. He is the Professor and Director of Foreign Affairs at Inner Mongolia University of Science and Technology, China. He has published about 80 papers in reputed journals/conferences and 4 books.

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