

Microsymposium

MS62.O05

High-entropy alloys in light transition metal systems

R. Kozak¹, W. Steurer¹

¹ETH Zurich, Department of Materials, Zurich, Switzerland

High-entropy alloys (HEAs) are a new class of alloys designed with the approach of maximization of configurational mixing entropy by increasing the number of constituents [1,2]. Alloys produced in such a way are reported for a variety of promising properties (high hardness and strength, wear resistance, magnetism etc.) [3]. However, origin of these properties (microstructure, phase content, element composition, thermal history) is not always clear. High mixing entropy in HEAs favours the formation of single-phase substitutional solid solutions at elevated temperatures with approximately equiatomic compositions and simple average crystal structures of either the cF4-Cu (fcc) or the cI2-W (bcc). Nevertheless, only a few element combinations produce truly single-phase materials. In order to search for new HEAs compositions samples in the systems Cr-Fe-Co-Ni-Al and Cr-Fe-Co-Ni-Mn were synthesized by arc melting and homogenized in tantalum ampoules at 1100 and 1300 °C for 2 weeks. DTA, X-ray diffraction and electron microscopy measurements were performed. Only samples with small Al content (~ 5 at.%) showed the single-phase microstructure. Their local atomic structure is under investigation.

[1] J.W. Yeh, *High-entropy multi-elements alloys*, Patent US2002/0159914A1, 2002., [2] J.W. Yeh, *J. Miner. Met. Mater. Soc.* 65 (2013) 1759-1771., [3] J.W. Yeh, *Ann. Chim. Sci. Mat.* 31 (2006) 633-648.

Keywords: intermetallic alloys, solid solutions, high temperatures